GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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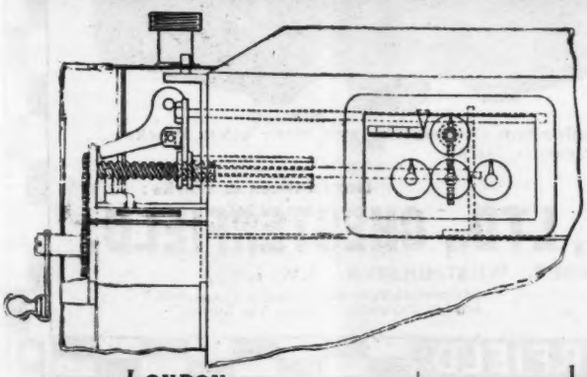

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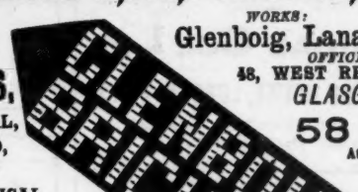

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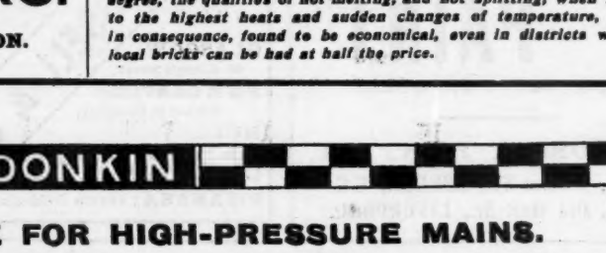

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VOL. CXLIX., No. 2966.] TUESDAY, MARCH 16, 1920. [72ND YEAR.

EDITORIAL NOTES.

Coal Gasification and the Heat-Unit Basis of Charging.

IT was said in the "JOURNAL" only two or three months since that the complete gasification of coal has come into the gas industry, and that it will stay there. The view becomes more established every day. Good reports of results continue to reach us; and there are fairly considerable gas-works to-day in actual negotiation for plants, and will soon be supplementing their ordinary methods by gas generators or producers, which give, without any residuals worth speaking about, 80 p.ct. heat energy of the coal in the shape of gas. Last week Mr. George Helps was demonstrating at Westminster his proposals for the supply of lower grade gas made by the complete gasification of coal in producers. Mr. Helps, we freely and gladly acknowledge, has been one of the foremost in this country as an active investigator and propagandist in the matter of realizing from coal the largest amount possible of B.Th.U. as gas. In making this acknowledgment, it would be ungracious to omit reference to the long years of work on the same road of Mr. C. B. Tully, and to that of various technicians and inventors on the Continent, who have been contemporaneously pegging away, but all of them finding a highly conservative industry largely unresponsive. We are somewhat loath to say anything about ourselves, but people are apt to overlook even facts that are on record. The fillip to the process of complete gasification is due to coal and cost conditions, and more particularly to the production of lower grade calorific gas. The present position has been reached by stages. There was no more strenuous fighter than the "JOURNAL" in the days when the struggle was proceeding for a reduction of the illuminating power standard from 16 to 14 candles; there was no stronger defender of the industry's interests when it was sought to limit the use of water gas by putting a restriction on carbon monoxide; and all through the war and the period of coal trouble there has been consistent advocacy in these pages of sending into the mains more and more B.Th.U—not per cubic foot of gas but per ton of coal carbonized.

Conditions have altered, and permanently. The industry is faced with higher costs on all sides; and the old-grade gas would now ever be dearer than it used to be. And so gas men are to-day taking greater interest in the question of the complete gasification of coal. It was thought at one time that the process was only suitable for small gas-works; but the engineers of larger works are taking an interest in the matter, and are giving out orders for plants. They are gas makers first; and secondary products must be sacrificed, or at any rate in part, if this policy will promote the interests of the industry. We foresee the time when there will be a very keen fight between complete gasification and the present methods of obtaining what are called high makes, *plus* secondary products, from coal by steaming in vertical or horizontal retorts, or by making blue or slightly carburetted water gas, and mixing it with the coal gas. The heat-unit basis of charging invites this competition between processes. The decision will rest on the balance-sheet, with as a persuading factor in the position the recognition that our strength in competition is in gas, and in the price at which we can sell heat energy. Secondary products, bringing down the net cost of coal, help to this end; the more B.Th.U. put into the mains per ton of coal, the less the total amount that has to be spent on coal and labour. Judgment has to be made as to whether it would not be better to dispense with the assistance of the secondary products, if this would enable the gas industry to make progress towards establishing itself on still more unassailable heights in respect of economy, efficiency in use, and labour saving. This is a matter for consideration, and not yet for dogmatic assertion one way or the other. Nothing can be done, or will be done, in the nature of a gas-making revolution, other than (as is already the case) at many of the smaller works. At other works any change will only be partial for a long time to come. We should not, however, like to prophesy; but we are quite prepared from the reading of the signs of the times, to express a deep conviction that the complete gasification of coal is going to make headway in the industry, and to its advantage, in view of the conditions prevailing. If we can to better financial purpose make gas instead of coke, we shall not have so much of the latter to sell to electricity concerns for steam-raising; and they may then become large buyers of gas. If we cannot produce ammonia in such large quantities as now, there are the synthetic and other schemes which will fill the vacancy created. But this is all looking to the future, and is speculative. As we say, revolution is not coming yet. The wheel, however, is turning, be it never so slowly.

The gas industry is going to sell B.Th.U. in the future; and as we listened last week to Mr. Helps, and saw all his demonstrations, the conclusion was come to that the balance-sheet must be largely the arbiter in decision as to choice of process. Money is dear to-day, and so is everything that money will buy—materials, plant, and labour among all else. The question of the relative capital expenditure per unit of production comes in. If there is complete gasification, and 1·33 tons of coal will give as many B.Th.U. in gas as 5 tons of coal did before, less coal handling and coal storage will be required, while the coke plant and much else will be eliminated. We are not pronouncing judgment, but only writing-down considerations as they rise in mind. The reduction of requirements in these directions must be accompanied by a lowering of labour. Less coal with the one system than the other has to be purchased; coal conservation is therefore served. Less coal being purchased with the non-bye-product gas plant than with the bye-product types, the cost of transport is so far diminished. Up to this point, there is no question that complete gasification has from the monetary side the best of the showing. Then in considering the matter, the next thing that has to be taken into account is as to whether the capital and working savings to be effected by complete gasification, and the 100 p.ct. or more increase (over advanced vertical working with steaming) in the B.Th.U. procured for sale in the shape of gas, can be compensated in other processes by the revenue derived from the secondary products?

We cannot enter into all these matters in this article. And, indeed, it is not only a question of balance-sheet, but of establishing the industry in a position beyond the possibility of attack as fuel suppliers. Mr. Helps last week illustrated the matter by calculation in an effective manner. He assumes that coal is purchasable at 30s. per ton, and that coal contains heat energy to the extent of 30 million B.Th.U. Under a system [these are our figures] making 12,500 c.ft. of 500 B.Th.U. gas per ton with bye-products, about 6 million B.Th.U. are produced. To obtain 30 million B.Th.U., 5 tons of coal, costing £7 10s., would have to be bought. A vertical retort system, with charge steaming, making 10 million B.Th.U. per ton, would only require 3 tons of coal, costing (at 30s.) £4 10s., with the value of the products to be deducted. Mr. Helps speaks of a make of 22,500,000 B.Th.U. per ton by his complete gasification system, which means 1⅔ tons per 30 million

B.Th.U., costing (at 30s.) £2. The production figure is justified; for Mr. Tully has recently recorded makes by his plant of 60,000 c.ft. of 400 B.Th.U. gas, which means 1¼ tons of coal to produce 30 million B.Th.U., or a make equal to 80 p.ct. of the total heat energy of the coal. Last week the information came through an independent source that the engineer of a medium sized works is obtaining with the Tully plant about 55,000 c.ft. of 425 B.Th.U. gas, which is 23,375,000 B.Th.U. per ton. Mr. Helps only makes two comparisons with a yield of 5,500,000 B.Th.U. under the old system, and with his yield of 22,500,000 B.Th.U. under the complete gasification system. Our report must be referred to for the data; but under the one system a consumer, gas being charged at 4s. 2d., would obtain 11,000 B.Th.U. for a penny (or 9d. per therm); while under the other he would have 40,000 B.Th.U. at his disposal for a penny (or 2½d. per therm) if everything works out according to calculation. This is something to investigate in these times; for what does it mean? It is that, combined with the greater efficiency of gas appliances than of coal appliances, the economy, efficiency, and labour-saving of gas would put coal out of the running in competition for domestic purposes. Take a coal of a value per ton of 30 million B.Th.U., and a coal fire giving 20 p.ct. efficiency. This will mean that only 6 million B.Th.U. are usefully employed. Take the same coal, and convert it into gas at 80 p.ct. efficiency—giving 24 million B.Th.U. in the gas. Gas-fires with a heating efficiency of 75 p.ct. would send into the room heat equivalent to 18 million B.Th.U.—three times more than the coal fire.

The question of inerts was well to the fore in the demonstrations. Seeing that they do not appreciably affect efficiency for most purposes, Mr. Helps cannot see the need for restriction. But if the results that Mr. Helps puts forward for complete gasification can be obtained without more than a quantity of inerts coming within the prescription of the Board of Fuel Research, then there is no need to supply more, if only to make the most beneficial use of the distributing plant, and to reduce the volume of the products of combustion. Mr. Tully's last article in the "JOURNAL," in which he refers to his latest type of plant, mentions only 10 to 12 p.ct. of inerts; with Mr. Helps's system we are not sure what the percentage [? 30 to 35] would be with gas of 400 B.Th.U., but we believe it is higher than the percentage to which the gas industry will have to work. If the Tully plant can be operated to give a low percentage of inerts, surely the Helps plant can be modified to do the same thing for the immediate purposes of the industry. If Parliament lays down rules which gas undertakings have to obey, our methods must (until these rules are altered) be such as will enable us to comply with them. This matter of the inert percentage, however, is one upon which more precise information is desirable from independent daily working conditions with the respective plants. We say "independent" not because we have disbelief in either Mr. Helps or Mr. Tulley; but when plants are out of the hands of designers and experts and in the hands of others, there are frequently differences in working results.

It will be interesting to watch the development of complete gasification in the gas industry. With the Board of Fuel Research recommendations as to the heat-unit basis of charges, some very striking changes in gas-manufacturing methods are sure to be made, with the view of helping to relieve the industry of its difficulties, and render its stability still greater.

The Minimum Dividend.

As was stated last week, interest in the question of a minimum dividend is growing in the gas industry. It is increasingly felt that gas capital must, in some way or other, be guarded in future from the disaster which has befallen it during the war. The existence of a minimum would be an attraction to future investors. It is not necessarily war alone that might bring about calamity to the capital of the industry similar to that which we have been experiencing. No one can tell what is before the country in reference to coal, oil, and labour. No one can tell what is in store for the country politically. Everything is veiled in uncertainty. But we know sufficient now to be able to say definitely that the fairly comfortable pre-war days are not likely to return—at any rate, for a long time ahead. New economic conditions have been established; new policies have been born in the labour world; and developments have arisen with which the industry will have to compete. Subject to sound financial terms being granted to it, the industry was never in a more fit condition to develop along lines that are best modelled to meet these changes. Among the new terms we should like to see the assurance that a minimum dividend would confer. Minimum levels of wages and standardized wages have become a principle and a fact in the labour world; and wages will not fall below them whatever may happen. What is right for labour is surely right for capital. At the critical Trade Union Congress last Thursday, Mr. J. H. Thomas, M.P., stated that "the workers desire no "privilege they are not prepared to concede to others, and "can accept no policy they would refuse to their opponents." If this represents the view of the labour party, then, so far as they are concerned, they should be the supporters of the industry's plea for justice. Capital and labour are equally necessary in industry. There must, however, be a care in the matter of a minimum dividend. Gas undertakings could not possibly agree to a uniform minimum, any more than they could to a uniform standard price. Individual circumstances would not allow it. The conditions upon which capital has been issued are so divergent—not only between undertakings but between classes of capital—that the minimum dividend would have to be considered and determined for each concern.

Gas as an Agent in Greater Production.

IF the Allies' manifesto on "Economic Problems" had been issued before Mr. H. M. Thornton read his remarkably interesting paper before the Royal Society of Arts last Wednesday, he might have put at the head as a text a paragraph that appears in it. It reads: "Not only the Govern- "ment of each country, but all those engaged in the task "of production in every land should give immediate atten- "tion to the execution of all measures which will contribute "to the resumption of peaceful industry, to the encourage- "ment of better control on the part of the workers in every "country, to the improvement of machinery and means of "transportation, and the removal of such disturbing factors "as profiteering." The last clause does not apply; but all the rest of the paragraph does. Mr. Thornton's paper was directed, in the first place, to show the need of increased production in the present economic circumstances, and to help to repair the enormous waste of men, wealth, and material that was occasioned during the four-and-a-half years of war. It is a mighty task that events have set this and other nations, and upon which only the slightest impression has yet been made. While the Government call upon all those engaged in the work of production to give immediate attention to the execution of "all measures" which will contribute to the resumption of peaceful industry, those so engaged must in their turn ask the Government to do their share in affording improved facilities. This is an appeal that the gas industry can make fully conscious and assured that, if the Government respond, the result will be a vast national advantage. If those who advise the Government would only read Mr. Thornton's paper, they would find the case proved up to the hilt as to the part that gas can take, and could take if afforded better conditions, in promoting industrial economy and efficiency, and thus greater production—bearing in mind that industrial supply is only a section of its enormous service to the country. The paper should also convince the Government authorities that heat is as important as power in the work of enlarging and cheapening production. We go so far as to say that in many of our essential industries heat is a superior factor to power, and that gas stands in the premier position among fuels as an economy and efficiency producing agent, and it can serve largely in hastening the manufacture of the machinery which is necessary to the promotion of output. Thus it has its place at the very beginning of the measures that must be taken to raise progressively the level of the production of the requirements of the industries, and then serve the industries in their normal and extending work.

That is the tale Mr. Thornton had to tell; and he told it well and convincingly. There was nothing hypothetical about it. It is all based upon fact, and upon result attested by continuous and extensive operations. He only dealt with the heat treatment of metals, because time forbade him to do more. But what he said regarding the bearing of gas on the realization of high economic results is just as applicable to other industries. Increased machinery is requisite not only to enlarge the production of goods, but (as Mr. Thornton points out) to fill the vacancy caused by the loss of man power through the war, and to provide industry with

machines of greater efficiency in place of those that have been worked at high speed during the war, or are inefficient when compared with newer types. In the acceleration of their production, the various types of gas-furnaces come in, as they also do in the ordinary work of industries. And gas-heated furnaces (which are constantly undergoing improvement) produce works economies which have never yet been adequately expressed in £ s. d. Mr. Thornton gives many expressive results as to the costs, weights, time, savings of waste, &c. (which are all tributaries to increased production), from actual working; and some of the data are astonishing to those who have only general knowledge of these matters. The fuel results alone are, for given work, largely in favour of gas as compared with solid fuel. And this because of the ability to regulate to any degree of temperature, and to obtain constantly even temperature throughout the furnaces; the result being that greater weights can be dealt with in certain processes, and more work be done in a given time and per man, and superficial foot of factory content. This means increased output and economy; and the credit of the money value of all this should be given to the agent that enables such performance. But as we say the complete balance-sheet has not yet been made out to show what gas can claim in effecting economy. It does not end there. No chimneys are required by the gas-furnace; less space is occupied by it than by the solid fuel furnace for equal capacity; it is capable of much more work; and the area of the factory is more productive. No purchasing, receiving, handling, or storage of solid fuel are required; and the working conditions for the men are better. All this and more is due to the agency of gas. It all means money, and so relative fuel costs alone are neither the sum nor the substance of the credit due to gas as a works agent, and a promoter and intensifier of output.

Knowledge of all this is making way into industry; and Mr. Thornton has rendered yeoman service in advancing the knowledge. This gives us the opportunity of making due acknowledgment of personal work. Mr. Thornton's first contribution to the subject was the paper in 1913 at the annual meeting of the British Commercial Gas Association, held during the National Gas Exhibition. Prior to that date, although there had been many noteworthy and highly successful efforts to develop the use of gas for industrial purposes, these were quite isolated, and confined to a small number of the larger cities and towns. There was not that keen realization of the prospects for industrial consumption which are apparent to-day, and credit for the awakening of interest and the consequent success must be largely given to Mr. Thornton. The lecture of 1913 (with its 100 illustrations of industrial applications of gas, and the appendix of over 200 processes in which it was known that gas was then being used) remains the standard work on the question, and nothing like so complete a summary has since appeared in print. We believe recently the Sales Organization Department of the B.C.G.A. compiled a list of the industrial uses of gas; and the number has risen to 300. Subsequently came the lecture at Newcastle-upon-Tyne, which was addressed not to the gas industry alone, but to the wider spheres of engineering, manufacturing, and to the public generally. There were also the papers before the Society of Arts in 1915 and 1917; and for the former the silver medal of the Society was awarded. The educative work has been continued at meetings of the Institute of Metals, and local bodies of engineers. All this has undoubtedly done much to impress upon the public at large the services which the gas industry rendered to the nation at a very critical period in its history, and of its potentialities in relation to peace-time work. The encomiums which Sir Robert Hadfield, Mr. D. Milne Watson, and Mr. F. W. Goodenough passed last Wednesday upon the work of Mr. Thornton in this connection were endorsed by the large audience; and, in our judgment, the thoroughness of the work merits this expression of approval.

Rapid Movements and Changes.

We can heartily sympathize with Mr. James R. Duff, who last Thursday entered upon his presidential work for the Midland Association of Gas Engineers and Managers. He confesses to having had some difficulty in selecting material for his address; and we admit the difficulty for a busy gas engineer and manager of a moderate-sized works, where the extent of the staff does not allow of much devolution of detail duty, and so upon the manager there is a heavy concentration of responsibility and supervision in looking after the interests of the concern in times when difficulties are of almost adamantine character, and trials and anxieties are never-ceasing. In these circumstances, it is quite beyond the power of any one man to give close, critical, and day-by-day attention to the movements of the times, other than as they affect immediate interests. The movements nowadays are rapid; many of them are vital to the future of the industry. Unless, however, an official has time to give close study to certain of the matters now engaging the serious attention of the industry, it is better for him to refrain from giving public utterance to immature views, or of opinions of the security of the foundation of which he is not sure. This fairly represents what Mr. Duff feels. All the same, busy gas officials have to find time to keep an eye on what is transpiring; otherwise there will be disaster to themselves personally and the undertakings whose administration is largely in their keeping. Busy as Mr. Duff is, he realizes this; and what he realizes he hands on to others. He has a "consciousness of impending change, and the "necessity of readjustment of old ideas and theories." And, again, "things move so quickly, and changes are of such a "rapid nature, that no engineer can afford to sit down, and "let things slide, if he is to keep his undertaking abreast of "the times." The "impending change" is markedly obvious every week in our pages; and as to "the necessity of the "readjustment of old ideas and theories," there can be no doubt. Those gas men who hereafter continue to live in the past, and be controlled by principles and theories that are out of harmony with the changes of the times, will reap the only result which indifference and neglect can produce. That there is no prospect of this happening at Banbury is clear; for the modest relation, in the address, of the changes that have been effected there in the works and distribution system, and in trading expansion, supply all the evidence needed that Mr. Duff has brought the concern into the front line to meet all the obligations upon it. Of this the members will have confirmation by the aid of their eyes when next they meet, which will be in the historic town where Mr. Duff so zealously carries on his official duties.

The One-Sixth Additional Allowance.

The Income-Tax Sub-Committee of the Gas Companies' Protection Association have been in consultation with the Somerset House Authorities, and have obtained elucidation as to what may be done regarding the additional one-sixth special allowance under Section 18 of the Finance Act, 1919. A circular-letter has been addressed to the members of the Association, giving the results of the consultation; but as the matter is one of interest to the industry generally, the Association have directed the Secretary (Mr. Fred E. Cooper) to make the information generally known to the industry through our columns. The letter will be found in to-day's "Correspondence" columns. The special one-sixth deduction, it will be remembered, does not in any way affect the right to charge as expenses the ordinary cost of repairs and maintenance in so far as they would be otherwise allowable. It is now explained by Mr. Cooper that the additional one-sixth allowance has particular reference to buildings containing machinery which would cause vibration, and that the allowance extends to buildings that are in conjunction with, and not separate or distinct from, those containing such machinery, although the conjoined buildings are not themselves occupied by machinery. The letter also gives information as to ascertaining the annual value of the buildings in respect of which the extra allowance is made.

Capital Issues Bill.

The Public Utility (Capital Issues) Bill has been before Standing Committee B of the House; and one or two useful amendments have been made. Seeing that they were in the hands of Sir Henry Cowan, it can with fair confidence be said that these are the changes in regard to which the National Gas Council of the Gas Companies' Protection Association have been moving. Sir Henry tried to get the omission of the words "by auction or tender," and the substitution of the words "in such manner as the Company may approve." But a proposal by Sir F. Banbury gained the confirmation of the Committee. This displaced "by auction or tender," and installed the words "to the public." The idea of this was to ensure that a company did not confine the new issues to the present proprietors, though goodness only knows they deserve consideration, after what they

have been forced by Parliament to submit to during the war. Of course, what is done under the Act will have permanence; but the exercise of the powers of the Act, it was proposed originally, should only be allowed for two years. At the instance of Sir Henry Cowan, the Act is to continue in force for five years, instead of two. This, again, is a useful change. The Committee have authorized Mr. Bridgeman, the Parliamentary Secretary of the Board of Trade, to ascertain from the Speaker whether the words "electricity or tramway" can be added to "gas or water," so as to widen the scope of the Bill.

Seven per Cent. Redeemable Stock.

When we see a sound concern like the Lea Bridge District Gas Company having to offer 7 p.ct. interest on redeemable debenture stock in order to attract investors, it shows what a pretty pass things have come to. The Governor of the Gas Light and Coke Company (Mr. D. Milne Watson) stated, at the recent annual meeting of the proprietors, that he knew of a gas company which tried to raise £20,000 of 6 p.ct. debenture stock, and only £600 was applied for.

G.N.R. and Gas and Electricity.

The opposition to clause 47 of the Great Northern Railway Bill has succeeded. All reference to gas and electricity has been withdrawn from it; so that, if the clause is accepted by Parliament, the Company will now only be able to purchase water where they please and use it on any part of their system. What will the Metropolitan Water Board say to this? If "water" is allowed to stand, it will constitute a precedent which may prove very inconvenient. The fact of the removal of gas and electricity from the clause is mentioned in the minutes of the Central Executive Board of the National Gas Council published in a later column.

Wage Increases and Value of Work Done.

It is to be hoped that a new rule the Industrial Court has established will be adhered to. The unions associated with the engineering trades have been moving for an advance of 15s. a week to men and 10s. a week to youths and boys. The Court has held that the claims of the men on the ground of the cost of living fails; but it expresses the view that the remuneration of the workpeople should now depend on the value of the work done, and that the value of the work done depends on the state of the markets. Having regard to the considerations arising in so assessing an increase, the Court has decided upon an advance of 6s. a week on the time rates of men 21 years of age and over, and an advance of 15 p.ct. on piecework prices. Half the advance is to become due on April 1 and half on June 1. An award almost identical in terms has been issued in respect of the ship-building and ship-repairing trades.

The Direct Actionists Swamped.

Those people in the labour world who thought they could by direct action break the whole nation into submission to their fads, fancies, and policy have found that, in their own industrial ranks, the wise men who believe in doing things constitutionally are in a heaped-up majority—indeed, of a magnitude four times greater than themselves. The Trade Union Special Congress last Thursday considered the question of the action that should be taken to bring about the nationalization of the coal mines. There has been less said about compelling lately; for it seems to have dawned upon some of the ringleaders in the movement that the people of the most democratic country in the world are not prepared to see their elected representatives performing according to the dictates of only a section of the nation. The miners from among themselves could merely get a majority of 178,000 in favour of a strike to "compel" nationalization—the actual figures being 524,000 in favour and 346,000 against. This shows a sharp cleavage of opinion among the miners. But when the Trade Union Congress came to vote on the subject of a general strike, it was seen that only 1,050,000 votes were cast in favour, and 3,870,000 against—nearly four in opposition to one in favour. Seeing the miners who voted for and against among themselves numbered 870,000, and only 1,050,000 votes were secured at the Congress, this shows how solid the other trade unions of the country are against taking totally immoral steps upon a national issue. It may be too that the other trade unionists are becoming a bit sick of paying a price per ton for coal which includes 21s. or 22s. wages to the miners, and also of the high-handed methods of the miners, which are having so much ill-effect upon the industries in which other unions are concerned. The majority was nearly as large in favour of taking political action to secure nationalization, which is not given up as a part of labour's policy. But even labour is not solidly in favour of nationalization; and, if it is to come at all, it must be through the ballot-box, and not through force. We see that Mr. Robert Smillie has on account of ill-health tendered his resignation as President of the Miners' Federation; but the Federation has asked him to reconsider his decision, and take a long rest ere finally making determination.

Further Wage Claims by the Miners.

The Miners' Federation are like a lot of spoilt children. If they cannot have everything their own way, temper and a desire to retaliate are shown. They cannot have nationalization, because the nation does not want it, and the other trade unions of the country are not sympathetic to violent measures to secure it. So the Miners' Federation have met, and have determined to ask for an increase of 3s. a day in wages for workers over 16 years old, and 1s. 6d. for boys. This demand is to be made because they cannot have nationalization, which interpreted their way means domination of the industry by the Federation. If it were not for export prices, the coal industry in present circumstances would be in an insolvent state. The selling price of inland coal is below cost price; and the balance of profits from export coal are being distributed among domestic consumers. Export profits have a load of responsibility upon them so far as this country is concerned. The Government and the Federation do not agree over the estimates of the surplus export profits; but the Federation say, as nationalization is not to be had, we will get for the miners about 45 millions more a year in the way of wages. Trouble is threatened if there is refusal. Nationalization was put forward by the Federation (so they thoughtfully avowed) in the interests of the community. Are the interests of the community, or self-interest, animating the leaders of the organization now? The nation are tiring of the miners' professions; their actions speak louder than words. If their objective was the ruin of the country, and not the lining of their own pockets, the miners could not proceed to work in a better way than they are doing. They have put a heavy handicap on all trade, and a burden on every individual; and now they propose to add to the weight. If not obtuse, the members of other trade unions will appreciate this.

The Coal Shortage.

The transport position continues to have to bear the disgrace of insufficient coal supplies to public utility concerns; and on gas undertakings the vital necessity of still increasing the production of water gas is being urged. It is time we began to feel some effect from the work of the Ministry of Transport. True the Department has not been in existence long; but locomotives and wagons have been returned from France at a fairly smart rate. In respect of coal supplies, however, things seem to be worse than ever, though the Prime Minister stated in the House last Thursday that (as the result of co-operation between the Coal Mines Department and the Ministry of Transport) greatly increased movements of coal were brought about during the last two weeks. Gas undertakings have not felt the effect of these movements. As to water gas, that they are already doing a large part in the saving of coal by manufacturing gas from coke, is acknowledged by the Coal Controller's Department; and some speeches at last Thursday's meeting of the Midland Association of Gas Engineers and Managers supply information as to what certain individual concerns are doing. The more that is done in this way, the shorter the industry appe ars to be kept in coal The Midland Association acknowledge that the National Gas Council have worked strenuously, and have done all they can to stir-up activity in meeting the requirements of gas undertakings. The Association are now sending a protest direct to the Coal Controller. The London electricity undertakings are also moving in the matter. A deputation from them waited upon London Members of Parliament at the House last Wednesday. The acute troubles were poured into the ears of the members; and Sir John Snell, the Chief Electricity Commissioner, rammed them well home. The deputation were in the result promised that representations should be made in the proper quarters.

PERSONAL.

In connection with the announcement of Sir DUGALD CLERK's regretted absence through illness from the meeting at the Royal Society of Arts last Wednesday at which Mr. H. M. Thornton read his paper, we are pleased to be able to state that inquiry has resulted in the gratifying intelligence that Sir Dugald is now rapidly recovering from a sharp attack of bronchitis, and that his doctor expects he will be able to resume work in London next Monday.

During last year, Mr. C. H. MASTER, who has been Chairman of the Woking District Gas Company since its inception in 1891, retired from the Board; and the Directors have placed on record their thanks for his long and valuable services. Mr. SAMUEL SPENCER has succeeded him as Chairman.

Among the new Magistrates for Chesterfield is Mr. GEORGE CLARK, the Managing-Director of Messrs. Bryan Donkin & Co. He has been a member of the Chesterfield Town Council since 1910 and has taken a prominent part in all public affairs in the borough for many years. Among other offices he fills that of Chairman of the Gas Committee of the Gas and Water Board. Mr. Clark was, during the war, a member of the Derbyshire Munitions Board.

The successor to Mr. Charles Potts as Engineer and Manager of the Hyde Gas Company is Mr. JOHN BRABBS, Gas Manager to the Bollington (Cheshire) Urban District Council.

Mr. PETER M'NAB, of the Low Moor gas-works of the Bradford Corporation, has been promoted to be Superintendent of the works, in succession to the late Mr. Alfred West, who was killed in a motor accident a few months ago. Mr. M'Nab is Junior Vice-President of the Yorkshire Junior Gas Association, and was for many years Treasurer.

Mr. THOMAS M'DOUGALL, the Manager of the Banff Gas-Works, has been appointed (out of 111 applicants) to the position at Melton Mowbray vacated by Mr. Casterton.

OBITUARY.

JOHN T. JOLLIFFE.

On Tuesday of last week, the death occurred at his residence in Park Road, Ipswich, of Mr. John T. Jolliffe, aged 77, who in 1914 retired from the position of Engineer and Secretary of the Ipswich Gas Company and has since occupied a seat at the Board of Directors.

Mr. Jolliffe's first association with Ipswich was in 1887. He started his business career at the Vauxhall works of the Phœnix Gas Company 56 years ago, and remained there till 1873, when he went to Sunderland. As was written of Mr. Jolliffe some years ago, "he showed a keen desire to be of assistance to those who were deserving; and there are men to-day occupying good positions in the gas profession who have not forgotten the kindly interest shown in their welfare by Mr. Jolliffe, and they have been and still are ever ready to express their gratitude to him." He had been in failing health of late, but attended the last annual meeting of the Company on the 25th ult., when he was re-elected a Director. Mr. Jolliffe has left a widow, two sons, and two daughters. One of the sons (Mr. Wilfred E. Jolliffe) holds a position with the Brentford Gas Company; and the other is an officer in the Army. The younger of the daughters was until last year with the British Legation at Copenhagen.

One of the local newspapers wrote of Mr. Jolliffe: "He did not take an extensive part in public life; but regular and practical service on the Ipswich Dock Commission, for many years, was one of the few directions in which he found relief from a life mainly devoted to his responsible duties in connection with the Ipswich Gas Company. Mr. Jolliffe had an exceptional stock of practical knowledge; and his judgment was always considered to be very sound. He acted as Consulting Engineer to several of the smaller gas companies of East Anglia. Among all with whom he came in contact he gained a reputation for urbanity and a high sense of justice, or what is sometimes called fair-mindedness. He was always most solicitous for the welfare of all employed by the Gas Company, however humble their position might be; and he was mainly responsible for the scheme which now exists under which the employees derive considerable benefit in the way of pensions. When he retired from the position of manager in 1914, after 27 years' service, the employees presented him with a handsome silver salver, and he entertained them all to a supper at the Co-Operative Hall, where the presentation was made."

JAMES LOWE.

We regret to announce the death of Mr. Jame Lowe, formerly Secretary and Manager of the Weymouth Consumers' Gas Company, which took place last Sunday week at Plymouth, where he had been residing since retiring. Although he had long passed the allotted span of life, news of his death will be received with considerable regret throughout the gas profession, and not only in Weymouth, where Mr. Lowe had a large circle of friends and admirers. All who knew him had a good word to say of him; and those who from time to time were brought in close contact with him in his work speak appreciatingly in praise of his ability, tact, courtesy, and kindness.

Mr. Lowe was a native of Taunton, and started his business career at the gas-works there. He was appointed to the Bridport Gas-Works, where he served about twenty years. In 1881 he was appointed Manager and Secretary of the Weymouth Company, succeeding Mr. Thomas Stone, who had also received his training at Taunton. He remained at Weymouth for twenty-three years—retiring in 1904. While at Weymouth Mr. Lowe prepared plans and re-modelled the whole of the works, erecting new retort-houses, coal-stores, boiler-house, and engine-room. During his long *régime* Mr. Lowe had the full confidence of the Directors of the undertaking; and on his retirement the staff of the chief office presented him with a handsome present, while from the employees at the works he was the recipient of a fitting testimonial.

Mr. Lowe is locally described as "a most genial and unassuming man—a man with whom it was a pleasure to work. While at Weymouth he took a very active part in the affairs of the South-West District Association of Gas Managers, of which he was Past President. He was also at one time a member of the Weymouth Town Council; but on seeking re-election in 1894 he was defeated. A prominent Freemason, Mr. Lowe held office in All Souls' Lodge. The funeral took place at Plymouth last Wednesday.

Gas Operated Refrigerating Plants.

Mr. W. F. Schaphorst, writing in the "House Heating Issue," of the New York "Gas Age," says that gas operated refrigerating plants—especially in small units—have long been regarded as a field for future cultivation by gas companies, to off-set the growing gas heating peak. He describes a new method of refrigerating, named the Bossé system, which uses gas, and has no moving parts. There are two methods of operation—the intermittent, which does not refrigerate during the generating period; and the continuous, which gives constant refrigeration. In the intermittent method the principal parts are a generator, a condenser, a receiver, and refrigerating coils. The generator is a seamless steel tank containing aqua ammonia. A gas-burner is lighted, and the ammonia gas is driven out of the solution into the condenser, where it becomes liquid ammonia again. This anhydrous ammonia then passes into the receiver; and when the receiver contains sufficient ammonia the heat is turned off, and the solution remaining in the generator is cooled. The ammonia valve leading from the receiver is then opened, and refrigeration occurs—due to the fact that when liquid ammonia is passing through a valve from a higher pressure to a lower pressure, it becomes a gas, and a great drop in temperature takes place. After the ammonia has done its work, it travels back to the generator. The continuous method is the same as the intermittent, except that two generators instead of one are used, permitting one generator to absorb the used gases while the other generates. This gas-heated system is so simple that no skilled labour is required. The operating cost for gas is, at the same time, remarkably low. In one instance, and this is not the best example, it is said, the makers guaranteed a better performance than 1 ton of refrigeration for each 800 c.ft. of commercial gas. The heat value of the gas was about 650 B.Th.U. At $1 per 1000 c.ft., this makes the cost about 80 c. per ton for refrigeration.

Presentation to Mr. Charles Potts.—On Friday, March 5, Mr. Charles Potts, the Secretary and Manager of the Hyde Gas Company (who is shortly retiring after 53 years' service), was presented by the employees with a case of pipes and a silver match-box as tokens of esteem. These were handed over by Mr. Fred Oldham, who has been in the service of the Company for over twenty years, and will shortly take on the duties of Secretary. Reference was made to the excellent relations which had existed between Mr. Potts and the employees.

Utilization of Blast-Furnace Gas.—In a paper read at Middlesbrough, before the local Institution of Engineers and the Institution of Electrical Engineers, Mr. S. H. Fowles, of Jarrow, said that, in seeking for a means of saving in fuel consumption, one should first of all look to efficiency. One instance of great wastage was in the form of blast-furnace gas. Under new methods, each furnace produced 1,000,000 c.ft. of gas per hour, and only 550,000 c.ft. of this was required for the furnace, leaving 450,000 c.ft. available for other purposes. This, at 150 c.ft. per kilowatt-hour, equalled about 3000 units of electricity per furnace per hour. With fifty furnaces, the aggregate would equal 150,000 units saved per hour, and 1,030,510,000 units per annum, which, with the boiler saving, represented an economy of about 400,000 tons of coal a year, and showed that the electrical energy which could be saved annually by generating from blast-furnace gas was almost equal to the total number of units sold during 1911-12 by the 303 electricity works of the United Kingdom. There were now some twenty places in the country where blast-furnaces were working; and these were to be increased during the next few years. Many of these places could not consume the whole of the gas produced; and with the adoption of cleaning plants and the use of large gas-engines, the time had arrived when still more and more gas would be available from the coke-ovens and from the coke used in the blast-furnaces.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held last Tuesday, at 30, Grosvenor Gardens, S.W.—Mr. D. Milne Watson in the chair.

The Chairman reported the steps which had been taken by the Council with regard to the totally unsuitable quality of coal for gas-making purposes which is being delivered to gas undertakings. A letter (dated the 6th inst.) was read from the Coal Mines Department stating that the District Coal and Coke Supplies Committees were doing everything possible to provide sufficient coal for gas undertakings, but that it was not possible in in every case to supply the desired quality. The Council were asked to bring to the notice of gas undertakings the necessity for accepting at the present time all coal consigned to them—adding that, in view of the existing transport difficulties, it was of the utmost importance that all wagons should be unloaded and handed-back to the railway companies without delay. A further letter from the Coal Mines Department (dated the 5th inst.) was read, urging upon gas undertakings the vital necessity of increasing the make of water gas wherever possible.

Members of the Board reported the impossibility of obtaining oil at the present time, and the serious situation which was being created both by the lack of oil and the totally unsuitable coal now being supplied. It was decided to publish the letters from the Coal Mines Department in the next "Monthly Statement."

An interview with the Coal Mines Department was reported with reference to the utilization by gas-works of "Kent Slack" for gas-making purposes. The representatives of the Department stated that their circular letter issued to undertakings urging them to use this slack was merely with a view to letting them know that such coal was available if desired, and was not in any way intended to compel them to use it. This slack, used by itself, is totally unsuitable for gas-making purposes.

It was reported that certain colliery companies had been making an attempt to increase the hire-charge for their wagons over that granted under the "Price of Coal (Limitation) Act, 1915." The Coal Mines Department had stated that this was illegal, and that they would be prepared to take up with the collieries any cases reported to them.

Reference was made to the recent limitation by the Coal Mines Department of export licences for coke. It was reported that the Coal Mines Department were prepared to make special arrangements with individual undertakings where these instructions could not possibly be carried out. The department would not allow coke to be exported where it had to be brought across country, and would only allow licences to undertakings situated near ports and the seaboard.

A scheme of the proposed propaganda to aid the Government Bill dealing with the financial position of the industry, which was expected to be introduced shortly after Easter, was submitted to the meeting.

Reference was made to the "Public Utility Companies (Capital Issues) Bill" now before the House; and it was reported that the Council were arranging for certain amendments to be moved when the Bill was considered by the Committee of the house.

It was reported that all reference to gas and electricity had been withdrawn from clause 47 of the Great Northern Railway Bill—thus limiting the operation of the clause to water only.

The further increased premiums recently announced by insurance companies, under policies taken out by gas undertakings to cover risks under the Workmen's Compensation Act, were discussed, together with a suggestion which had been made to the Council which would enable the gas industry to obtain improved terms. It was decided that a communication should be addressed to members of the Council on the subject.

BENZOL RECOVERY IN FRANCE.

A Move Towards a Calorific Standard.

The last number of the "Journal des Usines à Gaz" publishes the report of a Joint Committee set up at the beginning of 1918 by the Société Technique and the Professional Syndicate—the two leading organizations of the gas industry in France. The object of the Committee was to decide whether, from the technical and commercial points of view, it would be in the best interests of the industry to continue to extract benzol from coal gas on the conclusion of the war. After two years' work, they have produced a report which is of far-reaching importance to the gas industry in France.

The law in that country which made the extraction of benzol compulsory during the war laid down that "in no case were the processes of production and treatment to constitute a source of profit for gas undertakings." The efforts of the Committee were, therefore, in no wise directed towards effecting a continuance of the wartime measure—since, however willing the industry might be to serve the country in its hour of need, it could not be expected to work without any profit when the war was over. Their object, therefore, was to discover whether decontrolled benzol recovery would be advantageous or otherwise. Most careful inquiries were made, and installation and working costs were collected from every interested undertaking. The finding of the Committee was that, in the large majority of gas-works, the profits to be gained by the operation of benzol recovery would be purely problematical; and, therefore, there was no call to press the Government for legislation to enable it to be carried out. However, the information collected by the Committee clearly shows that consumers would not have realized that the debenzolized gas was any different had sufficient pressure in the mains always been maintained.

The report continues by stating that the world coal crisis induces the obligation to take into account every possible means of reducing coal consumption. In this light, other countries—after the experience of removing benzol from gas during the war—have been led to take other means for reducing their requirement of coal, as far as possible without injuring the consumers' interests. For this reason, their Governments have fixed a limit to the calorific value which can be demanded from gas undertakings. The Committee are accordingly of opinion, in view of the fact that the general use of the incandescent system of lighting has long since been an accomplished fact, and that the value of gas for lighting as well as for other purposes is therefore solely dependent upon its calorific value, and not on its illuminating power, that a petition should be presented to the authorities asking that, as soon as possible, in all new concessions for gas supply: (1) No further restrictions as to illuminating power shall be exercisable by the authorities, and (2) that the quality of the gas shall be described by its gross calorific value—the suggested maximum standard being 4700 calories per c.m. [528 B.Th.U. per cubic foot]. It is proposed that a 10 p.ct. variation should be allowed on individual tests; but this provision is not to apply to monthly, quarterly, half-yearly, or yearly averages.

The report has been unanimously adopted by the technical bodies concerned, and its recommendations are to be forwarded to the proper quarter, with a view eventually to obtaining the abrogation of the illuminating value clauses, and having a reasonable calorific standard fixed. All who are interested in the French gas industry are asked to collaborate in this urgent question of reform.

ELECTRICITY SUPPLY MEMORANDA.

Sir Harry Haward, Commissioner.

With the appointment of Sir Harry Haward, the Comptroller of the London County Council, as an Electricity Commissioner, the new body is complete. Through his work for the Council, Sir Harry has had an extraordinarily large and varied experience in financial matters connected with public bodies and concerns, including the electric power and tramway undertakings of the Council, and the granting of loans to the electricity undertakings of Metropolitan Borough Councils. His parliamentary committee experience, too, is of a mature character; and his official position has also led him into the maze of finance connected with the Metropolitan gas undertakings. He was one of the foremost hostile witnesses when the question of the financial hardships the gas industry was [and is] suffering was in 1918 under consideration by the House of Commons Committee. The evidence he gave probably reflected more the views of the Public Control Committee of the Council than his own personal opinions, though it is impossible to separate his brain from the answers he gave in cross-examination by Mr. Honoratus Lloyd. It will be remembered—at all events, by gas people now getting £2 12s. 6d. and 3 p.ct. per annum, less income-tax—that Sir Harry only seemed capable of fixing his intellectual faculties upon the position from the gas consumers' point of view. The point of view of doing justice to the capital employed in supplying gas to consumers appeared to have little attraction for him. It is a good thing that Sir Harry's reputation does not depend entirely upon the statements he made in cross-examination on that occasion, which statements are not supported by eminent financiers. Among other questions of importance, he was asked as to what he would consider was the minimum dividend the Gas Light and Coke Company should pay in order to maintain confidence in it as a stable financial institution. Witness said that he held the view that it would not matter if the confidence disappeared altogether during the war. In his opinion, in trying to raise capital during the war, people would realize the effect the war had had upon the amount of dividends paid. That Sir Harry was totally wrong in his estimate of the public has been proved by the fact that issues of redeemable debenture stock in the gas industry, carrying for this investment a high rate of interest, has failed to be successfully placed, and this despite the Statutory Undertakings (Temporary Increase of Charges) Act, with its miserable results. The position of the industry's capital to-day is a gross scandal; and the London County Council are largely responsible for it, and are, judging by the report recently issued, apparently still anxious to resist the capital being placed in a position both just and secure. However, Sir Harry Haward was before the Select Committee of 1918 as an officer of the Council, and so a mouthpiece. In his new capacity as an Electricity Commissioner, he will occupy a judicial position, and will not be weighed-down by, or have to conform to, a policy which has ever been obstructive to gas enterprise, and a policy which is roundly condemned in the industrial and financial worlds.

Supposed New Discovery by the Gas Industry.

Since the gas industry definitely prepared its case from the standpoint of coal conservation, and placed it in comparison with what the electricity industry is doing, and is likely to do in the most propitious circumstances offered by any part of the country, there have been several rambling articles in the electrical press designed, but flimsily and clumsily, to detach from the case some of its merit. But the case resists all these puny efforts. Behind it is actual performance, and something in hand, which will come out with increasing effect in the commercial competition of the future. Beyond incidental reference, the gas industry is not taking advantage of proved capabilities that cannot be universally applied immediately, but only (as they are being) progressively as opportunity permits. The electricity industry, on the other hand, makes its comparisons on the top efficiency that is predicted as possible, but as the technical men of the industry know full well only possible where conditions prevail that will allow of them being attained. This by the way. An example of an article written round about the question without touching the central substance has appeared in "Electrical Industries." The writer appears to think the gas industry's position in connection with coal conservation is something it has newly discovered; and he thinks it remarkable that, the gas industry, having existed for over a hundred years and the electricity industry for forty, this superiority in coal conservation has only lately been recognized. This is rather an amazing attitude for a man who is supposed to be alive to the movements affecting the interests with which he has to deal. The relative positions have been pointed out ever since electricity ventured out with uncertain step into the fields of cooking and heating—heating for all sorts of purposes; and it was only through the idiotic use that was made of the report of the Power Sub-Committee of the Coal Conservation Committee, by politicians and the newspapers of the country that induced the gas industry to state the relative positions in a manner over which there could be no misunderstanding. What is to be said, therefore, to the stupid declaration that gas undertakings were forced—"seeing themselves ousted from the lighting field, defeated in power, and threatened in both heating and cooking"—to "cast around for some new claim to survival. Their choice of coal conservation is very significant." Not long since an electrical expert, commenting on the singular writings on the matter in the electrical press, said gas men must be highly amused over them. They are; and what is more the amusement increases. There was no need for the gas industry to "cast around for some new claim to survival." It existed in fact, and only required to be made use of. It may be that the ordinary consumer does not care a snap about coal conservation. If all he is concerned in is to get the agent that will do his work most economically, and most efficiently, then he will find the agent in the one that is produced most economically and efficiently from the raw material used. Of this the electricians are fully aware, despite their senseless little game of bluff.

Electricians Beware!

There is much more of the same sort of thing in the articles. But it can pass; for a single sentence towards the close shows clearly what is in the mind of the writer. He says: "As for electrical engineers themselves, let them hesitate before these ingenuous invitations to friendly debate upon scientific problems." Why should they hesitate? We suppose the answer is intended to be conveyed in the words: "The gas industry, aware of its uncertain position, does nothing without a purpose." Just previously he speaks of the gas industry's frank invitations to friendly debate, which action shows that the industry is perfectly willing to discuss these matters. But it would seem that, though the invitation is frank—and here the writer indicates how beautifully illogical he can be—the purpose is one of craft. The ingenuous invitations do not look much as though the gas industry is "aware of its uncertain position;" and the advice to electrical engineers to hesitate rather proves that the uncertainty of position in relation to the "scientific" problems of coal conservation and fuel use is on the electrical side. If this is not so, there is every reason why the invitations should be accepted, because, whatever evil design the gas industry may have, the electricity industry would always come up trumps.

Electrical Water Heating.

We do not hear much about water heating by electricity in these times. It is one of those things over which every physical condition is against success. Time and expenditure are two conditions that stand for much in household economy, and so is convenience. A pretty little picture of a neat Bastian water-heater fixed over a bath is before us. One cannot get a decent bath with only ten gallons of water. At all events, we have a preference for something more than that. The heating element we are told consumes "only" 150 watts per hour in the 10-gallon size. If 10 gallons of water are required for a bath, to raise the temperature from (say) 48° to 150° would mean that, at 100 p.ct. efficiency, 10,200 B.Th.U. would be required, or (say) 3 units of electricity and starting cold no less than twenty hours would be required to do the work, and at 2d. per unit the cost would be 6d. But a heater of the kind cannot stand twenty hours without losing heat; so that the consumption would be more than the 3 units, and more time than the twenty hours would be absorbed to accomplish the work. With gas of 500 B.Th.U. per cubic foot burned in a geyser, and assuming an efficiency of 85 p.ct. (some types give a higher efficiency), the same work could be done as required with 24 c.ft. of gas, and, starting cold, in about a quarter of an hour the water would be available in the bath. At the present high rate of 4s. 8d. per 1000 c.ft., the gas would cost 1·33d. Is the statement of the "Electrical Times" true that, if the supply undertakings would charge a cheaper rate for electricity supplied for this purpose, electric water heating would compare "most favourably" with the gas heating of water and kitchen ranges? Delusions and self-deception seem to be very prevalent in the electricity industry.

Coal Resolutions for the Controller.

The electricity industry has its coal problems as well as the gas industry. This has been so extending far back into war time; and at one period there was collaboration between the two industries in the effort to improve matters. Of course, the gas industry is by far the larger buyer and user of coal; so that, as far as price, quality, deliveries, and transport go, the gas industry is the heavier sufferer. A conference of representatives of the electricity undertakings in Greater London was held recently at which resolutions were passed which it was decided to place before the Coal Controller. The first one proposes that the rebate to be paid under the Coal (Pit-Mouth) Prices Order, 1919, be paid directly by the Coal Controller. The use of the word "rebate" suggests the amount on the coal purchased for generating domestic electricity, and not the allowance to consumers of electricity. If this is the interpretation, we do not suppose for a moment that the Coal Control Department will be anxious for the additional work, the concentration of which upon it would mean a large increase in staff and a considerable enlargement of expenditure, which already runs into three-quarters of a million a year. Naturally, we have a great deal of sympathy with resolutions Nos. 2, 3, and 4. No. 2 is that special steps be taken to secure an adequate supply of coal for power stations and other public utility services. The gas industry would be extremely pleased if power stations had all the coal they want, provided gas-works are also supplied to the extent of their requirements. The third one is that the order relating to the acceptance of colliery weights be rescinded, and payment be made for weights actually received. The fourth one is that coal be properly graded, and paid for according to quality. What is the degree of hope on the part of the representatives of electricity undertakings in Greater London that these recommendations will be complied with by the Coal Controller? His obligations and difficulties are already of a severe order. Perhaps if they were sent to the Miners' Federation, they might arrange for a strike to secure compliance, on the condition that the electricity undertakings of the country supported their proposals for the nationalization of coal mines, railways, banking institutions, and public utility concerns.

Labour Costs.

Installation costs do not appear likely to recede—at any rate, labour is not contributing to that end. We see an agreement has been arrived at as between the London members of the National Federated Electrical Association and the London District Committee of the Electrical Trades Union as to rates and working conditions. A fully qualified electrical worker is now to receive 2s. 3d. per hour, and an assistant over 21 years of age 1s. 9d. per hour. The men are to get from home to job and from job to home in their own time, if within the agreed area—12 miles from Charing Cross, and within 12 miles of the employer's office. For a 47-hour week the 2s. 3d. will amount to £5 5s. 9d., and the 1s. 9d. to £4 2s. 3d.

Electric Iron Dangers.

A paragraph which appears in the "Electrical Review" should be issued as a warning to every purchaser of an electric iron. It reads: "The Sydney 'Evening News' reports an inquest on Miss E. G. M. H. Vidal (30), at Wollongong, who was ironing, when she was heard to scream, and was found standing by the table with her hands 'twisted round an electric iron.' When the iron was prized out of her hands, she fell to the floor, and could not be revived, though attempts to restore animation were carried on for one-and-a-half hours. Mrs. Markham said she had received a shock from the iron previously. Miss Vidal's slippers were damp; and an inspector for the City Council, Mr. E. F. S. Murphy, said he found the frame of the iron alive. If she had been on a dry floor, and had had dry footwear on, she would not have received the shock. The verdict was 'Accidental death.'"

Southern Association of Gas Engineers and Managers.

The annual meeting (the 45th) of the Association will be held next Tuesday at the Connaught Rooms, Great Queen Street, W.C. Instead of the annual dinner, the Committee have arranged for a luncheon at 1 o'clock, to be followed, at 2.45, by the business meeting. The report of the General Committee will be presented, a slight addition to the rules will be proposed, and an election of new members will take place. The address of the President (Mr. Charles F. Botley) will close the proceedings.

LOW-GRADE GAS AND GAS-WORKS ECONOMY.

MR. GEORGE HELPS'S DEMONSTRATIONS AT WESTMINSTER.

The Conference Room at the Central Hall, Westminster, was occupied twice daily from Tuesday to Friday last week by Mr. George Helps in demonstrating the value in use of low calorific value gas containing a high percentage of inerts. This, in pursuit of the propaganda that he has been carrying on for several years past, especially during the period of high-priced coal and short deliveries, due to the war, and the changed conditions in the coalfields. The demonstrations were well attended, and Mr. Helps and his colleagues very frankly and freely gave those present all the information that was required. We report below the speeches made at the opening demonstration, and give an account of what transpired at a subsequent one.

THE OPENING DEMONSTRATION.

On Tuesday morning, the series of demonstrations was formally declared open by the Lord Mayor of London (Sir Edward Ernest Cooper); while the audience which faced Mr. Helps in the Conference Hall included two representatives of the Paris Gas Company—MM. Sabron and Jacques Lévy (accompanied by an interpreter)—who intended to witness the whole of the demonstrations. The meeting was presided over by Councillor A. J. Ashton (Vice-Chairman of the Oldham Corporation Gas Committee).

The Chairman explained that he was presiding owing to the regrettable illness of Alderman Herbert Wilde, J.P., the Chairman of the Oldham Gas Committee. They in Oldham took up the question of low-grade gas eighteen months ago, because the conservation of coal, especially when the commodity was becoming so valuable, was of vital national importance. There were two points which appealed to the Oldham Gas Committee at that time. The first was the saving of coal for the nation; and the second was the sale of gas more cheaply to the consumer. But in Oldham they were cautious men, and were not satisfied with a demonstration at Nuneaton, and then another at Oldham before the whole of the Town Council. They were still cautious; and so their officials made many and exhaustive tests, until they became convinced. Now they were so satisfied, that Oldham had come to London to show London the way. In addition to cheap gas, he contended there was no one who had so much improved the various appliances for making and using gas as Mr. George Helps. They believed they had got a good thing in Oldham, and wanted other gas undertakings to share their good fortune. He had pleasure in welcoming the Lord Mayor among them, and in asking him to declare the demonstrations open.

The Lord Mayor said he understood that with the most efficient consumption of coal they could have cheaper gas; and to have anything cheaper nowadays was a proposition that commended itself very much to him. If the consumption of gas could be increased to such an extent as to give them practically a smokeless London, it would be a very great blessing. He had pleasure in calling upon Mr. Helps to open his demonstration.

Mr. Helps Explains His Proposals.

Mr. Helps said he was there to put before the audience various ideas in connection with the conservation of fuel; the principal fuel in this country being, of course, coal. He was going to ask them to look upon coal for the time being (if not always) as a solid form of gas, and gas as a fluid form of coal. He was there to demonstrate what had been done, and what could be done; and how town's gas in particular was now being manufactured, and how it could be manufactured, distributed, and sold for one-third its present price—or three times the quantity for the same money, whichever way they preferred to look at it. Then he should proceed to tell them how gas could be applied so that in many uses it could be made to do twice as much work as it was doing to-day. Next he would have something to say about the combustion of gas in one and two stages, and show the importance he attached—and he was sure his hearers also would attach—to combustion in one stage as compared with two, and also the importance of the flame being in close contact with the object being heated. Finally, he would call attention to the matter of inerts, with which the question of the quality and cheapness of gas was bound up. Those of them who were not familiar with the term inerts as understood by gas engineers, would recognize it as the part of the gas which the consumer looked upon as adulteration. Never in all the industrial history of the country could cheap fuel have been more welcome than to-day.

The main, broad object of these demonstrations was to bring about a cheap supply of coal or fuel in the form of gas. What he meant by cheap gas was a gas that would bear in cost a near relationship to that of the coal from which it was made. Good coal cost to-day about £2 a ton, and contained about 30 million heat units. According to his view, 30 million heat units in the form of gas should not cost the consumer more than something like £4 or £5. To-day in London and the country generally, £14, £15, and £16 was being charged for this quantity of heat energy as gas; and what he was concerned with was to show that it could be supplied at about one-third as much. If they could light a piece of coal with a match, and consume it under conditions of complete combustion, without any smoke or dirt, then, and only then, there would be no need for gas. The great point they had to remember in the gasification of coal was that, if they gasified it completely, they lost the sensible heat of the gas itself, which amounted to 20 to 25 p.ct. Whatever form of gasification was adopted, they must lose this in dealing with a ton of coal. Unfortunately, at the present time, with existing practice, it might, he thought, be said that considerably more was lost.

Free Work is Never Appreciated.

Proceeding with his subject, Mr. Helps said it was now generally admitted that gas in most of its forms—straight coal gas, blue water gas, producer gas—would do all that solid fuel did. The only thing that militates against its general use for heating and power purposes is its cost. Otherwise, its use for steam raising and the generation of electricity, &c., would be universal. The cost of fuel in the form of gas was of paramount importance to the country, both for industrial and domestic purposes. He was just as much concerned with the use of gas for the generation of electricity as for other processes. He had no prejudice in favour of gas against electricity, and recognized that cheap gas meant also cheap electricity. Upon what did the cost of gas depend? At present, in addition to the cost of coal, it was dependent upon two other factors—the sale of coke, tar, &c.; and also of late years it had been very considerably affected by the so-called free supply of apparatus and free maintenance of burners and mantles, or the provision of some service at substantial cost for which no charge was made. This was a very reprehensible practice. To deal with the second factor first, free work meant dear gas. The main thing was to give the consumer cheap fuel in the form of gas, and to teach him how to use it to the best advantage. The cost to-day of the services to which he had referred was in some cases as much as, or more than, the cost of the gas itself. The service in many towns was given at no less a cost than 1s. per 1000 c.ft. Free work was never appreciated; and this must be always unsatisfactory. Supply the consumer with cheap gas and cheap and efficient appliances, and cut-out the free services.

Complete Gasification and the Traffic Problem.

As Mr. Helps regarded the matter, he said there were to-day no gas-works in the country, but coke and bye-product works. So far as the sale of coke and other bye-products was concerned, he quite expected that when he suggested that the cost of gas was seriously increased thereby, it would be argued that the effect of bye-product manufacture was to reduce the cost of gas. He drew attention here to some cartoons prepared by Mr. Wallace Coop. One showed going into a gas-works 1000 tons of coal; and coming out 500 tons of coke. From the gasification that had taken place, there resulted 6,000,000,000 heat units. Another, relating to complete gasification, depicted 300 tons of coal going in, and the same heat units as before coming out. So that, said Mr. Helps, as touching the traffic problem alone, there was in the one case 1500 tons of traffic, and in the other 300 tons. With gasification, the whole of the 80 p.ct. of carbon in the coal could be put into the main, and instead of having from each ton of coal 6,000,000 heat units, there would be 22,500,000 heat units. These were the main matters which he had to demonstrate. He did not think there was any gas engineer, chemist, or scientist living who would argue against this representation of the facts.

Some Figures.

A ton of coal contained 30,000,000 B.Th.U.; and, calculating on the 22,500,000 B.Th.U. he had just mentioned, it would take 1⅓ tons of coal to give 30,000,000 B.Th.U. in the form of gas. If coal cost 30s. per ton, 1⅓ tons would cost 40s.; so that, if there were no further costs, 30,000,000 B.Th.U. could be sold in the form of gas for 40s. Labour and manufacturing charges were put at the ample figure of 13s. 4d., and adding 10s. profit gave a total of £3 3s. 4d. per 1⅓ tons of coal. Dividing 30,000,000 heat units by this £3 3s. 4d., gave 40,000 B.Th.U. for 1d. At present, he believed the price in London was 4s. 2d. per 1000 c.ft., which, with a gas of 550 B.Th.U., represented 11,000 B.Th.U. for 1d.

Experts who Advise the Government as to Inerts.

The next question he had to consider was, Why was gas not made in the simplest manner? Those of them who could look back some years, knew there had been various restrictions as to candle power and calorific value; and now they were threatened with restrictions as to inerts. "I do not," said Mr. Helps, "blame the Government for these restrictions, because obviously we have imposed them ourselves. Our efforts are responsible for the advice the Government acts upon. It has not been known until quite recently that heat units in gas of (say) 300 B.Th.U. are just as good as heat units in gas of lower or higher quality.

In other words, one heat unit is just as good as another. We are here to demonstrate that a gas with 50 p.ct. of inerts, so far as boiling a kettle of water is concerned, would give a considerably better duty than gas with only 3 p.ct.; and gas with 50 p.ct. of inerts can be made for a third or a fourth of the money."

Proceeding with his demonstration, Mr. Helps remarked that he did not think it had been generally realized that the consumer burned, or should burn, with a rich gas five times as much air as he did gas; and that if the quality of mixture the consumer used could be sent out from the works, it would be a great deal better for him than sending him gas so rich that he could not add the necessary quantity of air for its complete combustion. Quoting figures of tests for boiling a quart of water on an ordinary hot plate, with the air adjusted in each case to give the best flame possible, he said that with 550 B.Th.U. gas something like 1100 heat units were used; but with 150 B.Th.U. gas, 1000 heat units only were required. Then as to improved appliances, he would show them that, if gas could be properly used, not only could it be sold for one-third the price, but for many purposes—such as cooking and boiling water, for which a great proportion was used—the operation could be carried out with one-half the quantity of gas at present consumed. This was an average figure. He had himself tested various consumptions in different towns, and had found as much as 1800 heat units were sometimes used for the boiling of a quart of water, which could be boiled with 600 B.Th.U. Of course, this was mainly a matter of the adjustment of the burners; and for a number of years burners had been used which were not capable of the necessary adjustment. It had not been possible to burn the requisite quantity of air with the gas. Up to now they had always had two-stage combustion, with which the kettle could not be placed in too close contact with the flame. Combustion in one stage required no secondary air, and the kettle could be put down right on top of the flame; and the transference of heat was much quicker than in the other case. This was a most important matter. With rich gas, even putting in all the air required for complete combustion, there was a "film of flame" under the vessel much thicker than the flame with a gas of 450 B.Th.U.; and this thickness of flame was still less with a gas of 150 or 200 B.Th.U. It was to this that he attributed largely the advantage that low-grade gas had in heating propositions of this sort.

Comparing a 480 B.Th.U. gas with a 240 B.Th.U. gas with 55 p.ct. of nitrogen, he undertook to say that one would use less B.Th.U. of the latter when boiling a kettle of water. This showed, he went on, that inerts (so-called) were of very little consequence in the gas. He was satisfied from experiments he had made over a great number of years that if they sent out a 200 B.Th.U. gas, or anything like it, they would then be, practically speaking, putting the coal into the main, and would be able to sell to the consumer coal on tap in the form of gas at a price one-third of what it was to-day. Legislation had been promised by which it was intended to allow gas of any quality to be supplied, provided the inerts in it did not exceed 15 p.ct. "I do think," urged Mr. Helps, "that every effort should be made by those interested in the gas industry to prevent such a restriction being imposed upon it. Not on us; it does not matter to us. We make our profit, and we earn our income; but the consumer is going to suffer if this goes through. I am sure you will put your shoulders to the wheel, and find out who these experts are who are advising the Government, and stop their Bill from going through." ["Hear, hear."]

The Distribution of the Gas.

There were various ways by which they could, said Mr. Helps, get over the difficulty of distributing the much greater volume of the gas he was advocating. For one thing increasing the pressure could be resorted to. But for the complete gasification of coal the plant required was small, and units could be put up as and where desired.

VIEWS FROM OLDHAM.

Mr. Tim Duxbury (Engineer to the Oldham Corporation Gas Committee), in proposing a vote of thanks to Mr. Helps, said that in Oldham they had had very close contact with this gentleman in most of the work he had been doing during the last eighteen months or two years. They had every confidence that Mr. Helps was entirely on right lines, because they had proved things for themselves. They had made tests and carried out experiments to confirm or otherwise the statements that Mr. Helps had made from time to time; and they were thoroughly convinced. The Gas Committee of Oldham were in complete agreement with this, because they had seen for themselves so many experiments made. They had assisted to carry out these experiments, both collectively and individually, and had arrived at the conclusion that the future gas supply was to be low-grade gas. The further they went into the matter, the more convinced they were of the fact. In Oldham, before the war, the gas supplied was in the neighbourhood of 600 B.Th.U. For 1913, the average was 591 B.Th.U. gross; while previous to that it was even higher. That, however, was the year in which they began to test for calorific value. In 1914 the average was 593 B.Th.U.; in 1915, 575 B.Th.U.; in 1916, 558 B.Th.U.; in 1917, 535 B.Th.U.; in 1918, 522 B.Th.U.; in 1919, 456 B.Th.U.; and for the year ending March, 1920, it would be about 425 B.Th.U. It had taken some years to come down to this calorific value, simply because in a large manufacturing town like Oldham they could not possibly get to rock-bottom in the course of a few months. There were in Oldham probably 150,000 various appliances, and hundreds of thousands of burners, to adjust. It was therefore not an easy matter. They had, however, supplied gas of 425 B.Th.U. for twelve months; and for six months of this period, it was in the neighbourhood of 400 B.Th.U.—408 B.Th.U. average—in summer time, which gave satisfactory results with appliances that had been adjusted. What he wanted to speak about was the conservation of coal—a matter in which Oldham was, of course, greatly interested. Some four years ago, they started with a stock of 30,000 tons in October, and finished-up with 2000 tons in April. The year following they began with 20,000 tons, and finished again with 2000 tons. The next year they started with 9000 tons; and then came a time when they found they were compelled to consider the best means of conserving coal. They began by extra steaming in vertical retorts, and making blue water gas in the carburetted water-gas plant, and sending out a lower quality of gas. According to their balance-sheet, if in 1918-19, they had supplied gas of pre-war quality—*i.e.*, 600 B.Th.U. gross—instead of carbonizing 92,000 tons of coal, which they did, in order to make the necessary quantity of gas, they would have been compelled to carbonize 138,000 tons. By sending out gas of 456 B.Th.U. gross, or 411 B.Th.U. net, they had a saving of 46,000 tons of coal per annum. They were led to pursue the matter further by the fear of not being able to get through without running short of gas or having to cut down the pressures considerably; for it was very important in a town like Oldham, with so many mills and workshops, to maintain a proper supply of gas. This was why in the following year they came down from 456 to 425 B.Th.U. They had purposed going still lower; but, as he had explained, it took time. If they supplied gas of 400 B.Th.U. by a mixture of coal gas with blue water gas, or "Pleno," and if they obtained only 20,000 c.ft. to the ton, which could easily be done, instead of 10,000 c.ft. of 600 B.Th.U. gas (and he was sure they could not get 10,000 c.ft. with the present coal), they would save 69,000 tons of coal a year. He was thoroughly convinced that the time would come when there would be complete gasification of coal, and when gas would be used exclusively for heating and power purposes, for generating electricity, and even for the raising of steam in Lancashire boilers. Then Oldham would be beautiful—when they had done away with the 800 mill chimneys and 50,000 cottage chimneys, and had gas-fires in every house, and gas-boilers or electrical plant in every mill. To give an idea as to how they had succeeded in Oldham with respect to affording satisfaction to the consumers, he might say candidly that they had a great many complaints when they first began to get down below 450 B.Th.U. In fact, down to 450 B.Th.U. they had complaints; but by sending men round to adjust burners and appliances, they found they could give entire satisfaction, supplying even 400 B.Th.U. gas. They believed that even much lower than 400 B.Th.U. gas would give complete satisfaction with any appliance that they had fixed. There were in the Oldham area of supply 250,000 persons, probably 700 or 800 mills and workshops, and over 400 gas-engines, 56,000 gas-meters, 25,000 gas-cookers, and perhaps the same number of gas-fires, 7000 public lamps, and a large number of gas furnaces, geysers, ring-burners, &c., 242 miles of gas-mains, and a consumption of 1400 million c.ft. per annum. If they could, in a town like that, give satisfaction to their consumers, it could be done in any town in the country. Proof of satisfaction was to be found in the fact that their Commercial Superintendent was receiving daily from mills, churches, clubs, and even domestic consumers, letters of thanks for the splendid light they were getting now by comparison with what they used to get in years gone by. This proved that low-grade gas could be made to do the work of any kind of higher grade gas. He had come definitely to the conclusion that there was no "bad gas." Wonderful results had been secured in an incandescent burner with 250 B.Th.U. and 300 B.Th.U. gas; it gave a beautiful white light. Everything pointed to the best light being from low-grade gas. With the thousands of incandescent mantles in use in Oldham to-day there would be found no sooting-up, such as they used to experience with 600 B.Th.U. gas. Not a single mantle would be seen with any deposit upon it which would interfere with the lighting power. A great many tests had been made by them of high and low grade gas for boiling purposes; and without exception the low-grade gas would boil a quart of water with a less number of heat units than a high-grade gas. With the "Pleno" burner, or on an ordinary cooker hot-plate, the low-grade gas would give the better result. In one test, a gas of 610 B.Th.U. required 1793 heat units to boil a quart of water; while a 450 B.Th.U. gas needed only 1516 heat units. In another test, a 593 B.Th.U. gas required 1726 heat units, and a 441 B.Th.U. gas only 1521 heat units. With a recently invented burner which had been casually mentioned by the lecturer, they found they could get marvellous results. With this burner, in comparison with other cookers and hot-plates, generally speaking to boil a quart of water the gas consumption was only one-half as much. By the adoption of this alone, even without complete gasification, what a saving there would be! They had in Oldham proved to be perfectly correct every statement Mr. Helps had made respecting the efficiency of his "Pleno" burner. In fact, they were so interested that they had taken the trouble to come to London for several days to give the results of their experience. Mr. Helps was doing national work—work that no gas engineer or body of gas engineers had ever before attempted to do. He was a pioneer of low-grade gas for town purposes.

Councillor Perkins (Oldham) seconded the vote, and corroborated what had been said by the Chairman and Mr. Duxbury.

He declared that they believed Mr. Helps to be a public benefactor at this period of the country's history.

Mr. Helps, in response, said the consideration he had received from the Gas Committee and Town Council of Oldham had made a mark on his life which nothing would ever efface.

A vote of thanks to the Lord Mayor brought the proceedings to a close.

In the afternoon, the chair was at first occupied by Major-General Sir Frederick Poole, and afterwards by Councillor Ashton. There was a full gathering of engineers from all parts.

AT ONE OF THE DEMONSTRATIONS.

It is impossible in the space at disposal to follow in detail the demonstrations that Mr. George Helps, assisted by Mr. W. Cranfield, and other members of his staff, made day by day and hour by hour; but a sample demonstration on Wednesday morning last may be briefly sketched. Large cartoons graphically illustrating some of the main points were hung on the walls of the lecture room. On the stage were gas-ovens, boiling-rings, hot-plates, in glorious profusion, together with a long steam-boiler burner in front. At the side of the room were further examples of burners and other appliances, together with a small gasholder containing pure nitrogen, so that gas of any calorific power per cubic foot, and incorporating any predetermined proportion of inerts, could be supplied, and be demonstrated with. As a matter of fact, Mr. Helps's "Pleno" system is really divided into two parts. He puts forward a system of complete gasification; and the resulting product is what he has named "Pleno" gas. The gas-consuming appliances that have hitherto been produced fall short of the efficiency which Mr. Helps considers should be obtained; and therefore he has designed appliances by which a higher efficiency can be realized with the low-grade gas than could be obtained by using the gas in unsuitable burners. Thus he combines two units of economy, which he claims must benefit the nation, the gas industry, and the gas consumer. Whatever and wherever economy is achieved, it must, of course, be of national advantage. We will at once give Mr. Helps a considerable amount of credit. He has worked hard and steadfastly at this low-grade gas business; and his propaganda work has not failed to direct men's minds into new channels of thought regarding it. This, too, must be said, that nowhere in the demonstration did he say that his system was the only means of accomplishing what he sets out to do, nor that it represents finality in the complete gasification of coal.

The Gas Used.

In the demonstrations, Mr. Helps laboured under a disadvantage. He could not bring "Pleno" gas from Nuneaton, nor could he put up a gas-producer plant in the hall, and so his demonstrations had to be with a substitute. It was Gas Light and Coke Company's gas, with which there is probably mixed about 25 p.ct. of water gas at the present time; and into the mixture Mr. Helps was putting from about 50 to 55 p.ct. of pure nitrogen. The Gas Light and Coke Company's gas being of about 475 B.Th.U. quality, it will be seen that the demonstrations were being carried on with gas of a low calorific quality per cubic foot delivered at the gas injectors; but with this gas he proved that he was able to get into it as primary all the air required to effect complete combustion. The result is a coneless, intense flame, which gave a wonderfully smart account of itself in making water boil. The gas, although not "Pleno gas," answered well the purpose of the demonstrations.

Saving of Transport and Costs.

By the way, the hall was well filled on this as other occasions; and a good sprinkling of gas men were noticed there, as well as men interested in local government. We heard of the large saving in coal purchasing which would be brought about by transferring more of its heat units to gaseous form; and this is coal conservation. There is the saving of transport, and the handling of vastly different quantities of coal. Just think. Into a gas-works 1000 tons of coal are carried, of which some 80 p.ct. is carbon; from the 1000 tons, 500 tons of coke are brought out again—the coke containing from 80 to 90 p.ct. of carbon. This is regarded by Mr. Helps as an absurd condition of things, as 300 tons of coal would do all the 1000 tons do to produce heat units in gaseous form, if the coal were completely gasified. It only requires a little consideration to see what this involves in savings—transport, capital, plant, labour, and so forth. Such savings, always important, are more so than ever in these days; and gas engineers will have to take them very carefully into account, in conjunction with the question of the sale of heat energy.

Wasted Quality.

There was no comparative demonstration (at any rate on this occasion) to substantiate certain of the statements made. All that most of the audience could do was to accept at their face-value Mr. Helps's statements relating to the higher calorific grades of gas, and make deductions as to their accuracy by the demonstrated effects of the heavily nitrogenized gas. "Pleno" gas can be made of any calorific quality. One can have 400 B.Th.U. gas, and one can go down to 200 B.Th.U., if thought desirable. With gas as ordinarily made—gas of 500, 550, or higher B.Th.U.—there are, Mr. Helps contends, no gas-consuming appliances that will, in the average of uses, at low pressures, realize complete combustion. It is his view that some 30 to 40 p.ct. is absolutely wasted; but with the lower-grade gas, one can get burners that will inject all the air required as primary, and have a coneless hot flame. This is what is called one-stage combustion. With the appliances and gas used to-day, there is a cone in the flame extending two-thirds of its length. In the gas Mr. Helps proposes should be supplied, there is (although the word coneless has been used) just a show of cone, not extending more than 0·1 in. into the flame. The flames are short and concentrated, not as with the old gas; and this restricts the waste of gas and heat units in such operations as water boiling. A greater proportion of the heat returns value in work, and less is wasted. Mr. Helps assures us that he has known 1800 B.Th.U. used to boil a quart of water with the higher-grade gas; whereas it can be done with 600 B.Th.U. with the new-grade gas. On working out, the latter shows over 68 p.ct. efficiency. The kettle sits well down on the flame—not creating smell or long tails of flame causing waste.

The Inerts in the Gas-Air Mixture.

We were taken to the subject of inerts, and to the relative requirements of air for high and low-grade gas. We heard by word and were shown diagrammatically that taking as a basis 100,000 B.Th.U. of a gas containing 3 p.ct. of inerts, the total inerts in the gas-air mixture would be 68·2 p.ct. In a gas equal to 100,000 B.Th.U. to which 15 p.ct. of inerts is added, the total inerts in the gas-air mixture would be 68·8 p.ct.; and with a gas equal to the same number of heat units, to which 30 p.ct. of inerts is added, the local inerts in the gas-air mixture would be 69·9 p.ct. Thus the percentage of difference in the mixture that the ordinary consumer burns whether the gas he receives contains 3, 15, or 30 p.ct. is so extremely small as to be negligible; and the slight difference in flame temperature is, Mr. Helps holds, no detriment to the consumer. With gas containing 30 p.ct. of inerts, 100,000 B.Th.U. can, he points out, be supplied for about one-third the cost of the gas containing only 3 or 15 p.ct. of inerts—that is gas made by complete gasification of the coal.

When demonstrating the effect of inerts and the small quantitative bearing they have in the gas-air mixture and upon efficiency, Mr. Helps commented upon the fact that a Bill is to be promoted in Parliament which will enable gas to be sold on the heat-unit. basis; and if passed, there will be no reason to complain of inerts He pronounced the heat-unit basis of charging as one of the greatest advances the gas industry has made, because gas is heat energy, and should be sold on this basis. It is his opinion that gas consumers will not allow Parliament to restrict the inerts to 15 p.ct.; if they do, heat energy is going to cost them two to three times as much as it need. Accustomed to getting only 6 million B.Th.U. per ton of coal, is it (asked the demonstrator) likely that a little extra nitrogen is going to be allowed to prevent the realizing of more advantage? He emphasized the point that as much as 50 p.ct. of nitrogen in the gas is no detriment whatever, when the charge is made on the heat-unit basis.

A Good Pennyworth of B.Th.U.

The gas consumer who reads what Mr. Helps had to say will long for the good time when he will be getting 40,000 instead of 11,000 B.Th.U. delivered to him for a penny without any trouble. That is what Mr. Helps says is in prospect. He puts it this way: Coal contains about 30 million B.Th.U. Made in the simplest way, gas will contain 22½ million B.Th.U., or only 25 p.ct. less than the coal. To make 30 million B.Th.U. in the form of gas, 1⅛ tons would be required, costing (at £1 10s. per ton) £2. Labour charges, producers, &c., and all manufacturing charges, excluding profit (at 10s. a ton) would amount to 13s. 4d.; and the profit (at 7s. 6d. per ton), 10s.—totalling £3 3s. 4d.

$$\text{Gas made } \frac{\text{30 million B.Th.U.}}{\text{£3 3s. 4d.}} = \text{(say) 40,000 B.Th.U. for 1d.}$$

Taking gas as at present made, and 1000 c.ft. of 550 B.Th.U. gas costing the consumers 4s. 2d.:

$$\frac{\text{550,000 B.Th.U.}}{\text{50d.}} = \text{11,000 B.Th.U. for 1d.}$$

But the consumer must not think changes like this are going to be made all at once. This is Mr. Helps's own warning, nor does he suggest that gas suppliers should make steep drops at once in the calorific power of their gas. It is a matter for progressive treatment. He does not suggest that in one step there should be a decline from 500 to 400 B.Th.U. and lower; something intermediate is better. When, however, gas does eventually get down to 300 to 350 B.Th.U., in his opinion consumers will be better pleased. There will be little use for the complaint book; there will be no naphthalene; there will be no smells; and the price of heat energy will be reduced very considerably. To-day, gas undertakings are charging from about £15 to £20 for the same heat energy that there is in a ton of coal; while the same quantity can be sold by complete gasification for £4 or less, and a good profit be made. This is the position as sketched by Mr. Helps; and taking his stand upon it, he asks, Can our present processes be right?

Distribution of Low-Grade Gas.

Then we heard about the distribution of gas, regarding which some gas engineers have ill-forebodings if very low-grade gas is supplied. But Mr. Helps has no fear in this respect, with distribution systems that are in respectable condition. It is nothing to send gas out to-day at 100 lbs. per square inch pressure; and he would not mind going to 200 or 300 lbs. if it were necessary. But it is not. All that is required is 10-10ths or 6-10ths at the

consumers' appliances, because the work the appliances have to do in injecting air is also much less. Gas undertakings can have boosting with feeders through the district, or with simple gasification as many producing plants at different parts of the area as they like—on the outskirts, and feeding to the centre of the town. The gas, in fact, could be distributed without increasing distribution costs.

Further Information from Oldham.

These are the main points that came out during this one of the several demonstrations. At its close, Mr. Ernest Parry, the Commercial Superintendent of the Oldham Gas Department, gave Mr. Helps credit for pioneering work in this matter. He also told us how in Oldham it is intended to deal with the distribution problem in connection with low-grade gas. It is not contemplated to relay with larger pipes the 240 miles of mains; but the laying of 7½ miles, divided into five feeders, will give the distribution system double the capacity. The cost will be something like £40,000. With low-grade gas, the Gas Department can easily afford this. He also charged the Gas Investigation Committee of the Institution of Gas Engineers with ignoring in their investigations a boiling burner which will give 70 p.ct. efficiency—the one Mr. Helps has designed. He also related how a gas engineer told him the previous day that he had been sending out gas of about 380 B.Th.U. and the consumers were satisfied. On increasing the quality to 430 B.Th.U. complaints began to roll in. Mr. Parry proposed, and Councillor Shannon seconded, a vote of thanks to Mr. Helps; and with a reply from this gentleman, the demonstration ended. An inspection of the appliances was then made.

A Few Other Jottings.

The demonstrations were held twice daily from Tuesday to Friday. In the main, each address by Mr. Helps was similar to the one described above—some slight variation being made at times in the direction of a little fuller treatment of first one and then another point. The attendances were very good, the hall being well filled each morning and crowded each afternoon. As a matter of fact, the opening morning demonstration had probably the smallest patronage. The attendance of gas engineers, and members of gas companies and committees from all parts of England and Wales, was very gratifying. Several gas committees sent fairly large deputations. Birmingham was well represented on Thursday afternoon, and the Gas Light and Coke Company on Friday afternoon. On Wednesday afternoon, Mr. W. A. Caradoc Rees presided. The Chairman on Thursday was Major-General Sir Fredk. Poole; and on Friday, Mr. F. E. Caldecott, of Coventry. Questions were freely put at the afternoon demonstrations. Wednesday and Thursday afternoons there was a lively interlude, a visitor (the same one each time) working himself into a fine frenzy over the carbon monoxide bogey. On Wednesday he declared that to bring CO laden gas into houses at 10 or 15 lbs. pressure was unspeakably dangerous; and when told that no one ever proposed or did such a thing, he asserted that no reducing valves, &c., for bringing main pressure down to domestic requirements were trustworthy. On Thursday, with equal ignorance of what he was talking about, he referred to the danger in bedrooms of producer gas and water gas, because of its greater density. On this occasion, Dr. E. W. Smith, who had from his position in the room heard more distinctly than those on the platform, administered an effective quietus.

On Thursday morning, Mrs. Lloyd George came for a private demonstration at the close of the public demonstration.

Mr. Tim Duxbury repeated the substance of his Tuesday morning's speech at each session, except one or two, when Mr. E. Parry, the Commercial Superintendent of the Oldham Corporation Gas Department spoke to similar effect.

On Friday morning Mr. W. Cranfield took the place of Mr. Helps, reproducing his points, but in the speaker's own words and way—opening out a little more fully than Mr. Helps had done on the question of inerts.

A Final Message.

Yesterday the following message was received from Mr. Helps:

> The valuable publicity given by you has made my demonstrations on coal conservation at the Central Hall, Westminster, an unqualified success. It is now recognized that true conservation of coal depends on gasification and distribution by cheaper methods than the present Government restrictions as to quality and inert contents allow. Coal distribution in the form of gas and electricity will be almost entirely done by gas and electricity undertakings, so soon as the price of coal in these forms approximates to that of the coal itself. I venture to tender to you my most respectful thanks before leaving London.

On Thursday, members of the Midland Junior Gas Association will visit the coal, lime, and iron works, near Chesterfield, of the Clay Cross Company. They will be met by Mr. J. Steen (the Secretary of the Company), and an interesting programme has been mapped-out.

The postponed visit of the Scottish Junior Gas Association (Western Section) to the Pumpherston Oil Company's works will take place next Saturday. The annual general meeting is fixed for the following Saturday [March 27], in the Royal Technical College, Glasgow, when Mr. George Helps will deliver an address. The meeting will be followed by a social gathering.

CO-OPERATION AS A MEANS TO EFFICIENCY.

By "Engineer."

During three-and-a-half years of the war period, the writer was engaged as works manager of an undertaking making war material, under a private company, controlled by Government under the Munitions of War Acts, and employing 600 men as a maximum. Many new problems were presented for consideration, some of which were satisfactorily solved by the writer and his colleagues, while other efforts were rewarded with only a scant measure of success—due to errors of conception, or owing to lack of the time necessary for their full development. Not the least of these problems directly concerned the human element; and these notes are written in the hope that some of the ideas and methods may be of use in the gas industry, with necessary amendments to suit administrative or local conditions.

Since the introduction of co-partnership, great strides have been made in our industry in the fostering of an amicable spirit between employers and employed. But recent developments prove that co-partnership, without something to supplement it, only touches the fringe of the subject; and that, by itself, it will not develop the broadened outlook and intelligent application which are required in these changed conditions. This fuller conception of the "trivial round" is sought by the worker as much as it is desired by the employer. But the worker is inarticulate, with the result that his grievances are exploited by the extremist, who often degrades the higher aspirations of the worker to a mere plea for more payment and shorter hours. The net result is that the worker who started by looking on co-partnership as a dodge on the part of the capitalist, even now sees little more in it than a means of adding a shilling or two to his weekly wages.

We must first admit that some years ago, the worker had good reason to regard the employer as his natural enemy (not so much in the gas industry, but certainly in many trades), and that the employer was always ready to take advantage of any circumstance to gain increased profit or other favours. The effect of this has been cumulative, with the result that to-day there is a spice of malice or revenge in the attitude of the majority of workers.

Works Committees.

The recent meetings of gas companies have been marked by references (and very satisfactory references) to the good results arising out of the formation of these Committees, showing that co-partnership is not in itself sufficient to get the maximum of efficiency. But there is a danger that they may become too formal to encourage the freedom of intercourse necessary to get to the root of the subject under discussion. In the writer's case, a works committee was formed, giving the men the whole of the representation. All grades and departments were brought in—including foremen; and the works manager was the sole representative of the board of directors, as the latter were busy men, and not available for frequent meetings. When matters were brought-up for decision, many could be settled on the spot in the men's favour; some were of such importance that it was deemed necessary to consult the board; while others were so obviously unreasonable that a few words in explanation usually convinced the delegates that the board would probably refuse to act upon them. If the men insisted, then the board were consulted, with a short report on the conditions under which the request was made, and the reasons given why the application should not be granted. And at the same time the delegates were informed of the nature of the works manager's report accompanying the application.

It is not suggested that all works committees should be run on these lines; for the presence of the director usually forms the necessary link between the employee and the board. The illustration of the actual operation of this committee is inserted to show one method which attained success in the circumstances mentioned—*i.e.*, the inability of the directors to attend. It is obvious, however, that whether directors are members or not, power should be given to the employers' representative to settle most matters on the spot—in fact, to deal with everything except questions involving large sums of money or serious alterations in principle.

Canteen.

The canteen was installed before the works committee; and the latter body undertook its management—the chief clerk being responsible for the monthly audit of the accounts. The company undertook all the capital expenditure necessary to start the concern, with an agreement to have a first call on the assets on winding-up. Otherwise the canteen was run on self-supporting lines; and the secretary was paid a small salary to keep accounts and supervise generally. The purchase of goods was in the hands of the canteen sub-committee; but advantage could be taken of purchases by the company if the men so desired it.

Employees' Register Card.

Full details of all workers were recorded on separate cards. Among the particulars were the following: (1) Name, date of birth, and address. If in lodgings, or at a temporary address, the home or permanent address was recorded. (2) Previous employment, length of service, and reason for leaving. (3) Whether married or not. If the former, whether wife was alive, and number of children. (4) Rate of wages engaged at, overtime rates and general conditions of service, together with the description

of trade or department engaged in. Finally, a short set of works' rules was handed to the man, which he was requested to read; and then he attached his signature to the card, signifying his acceptance of the position at the wages and conditions stated, his acknowledgment of the list of rules, and his certification of the personal particulars as furnished to the registration clerk. At the back of the card, space was provided to record subsequent increases of wages or transfers, and a log during employment, which was used to note matters both for and against him. On leaving the works, the reason for leaving was stated; his general character inserted; and other remarks, followed by the works manager's signature, which signature also appeared on the front of the card on the day of enrolment. A condition of employment was that no man need join, or refrain from joining, a trades union.

The value of this registration card need not be laboured. In cases of accident or illness it was found to be extremely useful.

Discretionary Fund.

While on the subject of accidents or illness, it may here be stated that the board allowed the works manager a certain sum per month to be paid out at his discretion for the relief of hard cases—the greatness of the need and the value of the worker being the measure of the relief granted. The existence of this fund was not common knowledge, with the result that it was never abused.

Suggestion Box.

There is, of course, nothing new about this; but it is astonishing how few works have adopted it. In the writer's works, it was placed in the messroom; and the value of the suggestions was graded into sections, with corresponding rewards for each grade. Any branch of the work could be taken up—affecting the speed or safety of the operations, labour saving, labour lightening, or health of workers; and no suggestion was deemed too trivial for consideration. Periodically, the men offering suggestions were called together, and their suggestions discussed more fully. If they were only partially adopted, or not adopted at all, the reasons were given. Excellent ideas were received; and occasionally it was pointed out that an ingenious idea was not capable of full development owing to the volume of material handled in the particular operation not being sufficient to justify the capital expenditure or structural alterations involved.

The Human Suggestion Box.

The logical outcome of the scheme was prompted by an application of a middle-aged man for employment in any capacity. From his enrolment card, information was gained that he had been engaged in a business of his own in a neighbouring town, but retired early in life. On making inquiries, it was found that he had run the business, though not a large one, with considerable success. After an interview, it was plain he was a man of personal charm, possessed of tact and ability, which only needed a proper channel for its display. After a few days' probation, the man was given a roving commission to do practically what he liked in the way of investigation, but was given no official position, and no administrative power. He made it his business to take up any things which appeared to be nobody's job; and in the best-regulated works some things are sure to escape attention.

As soon as we made it clear to the foremen and others that he was there to help and not to "boss," he formed a valuable link between the management and the men, and incidentally saved the writer much time and trouble. During his period of office, he came to understand the men, as they soon realized that he was there to make things easier for them. Many pin-pricks were removed as a result of his work; labour-saving devices were installed; and, in fact, nothing was too small for his attention, even down to removing obsolete notices from the various boards around the works. The writer feels that such a man could be usefully employed in all large works. But the man must be carefully chosen. In the case above referred to it was a piece of good fortune to have such an official thrust under one's notice.

Inter-Departmental Co-Operation.

It is difficult in all large undertakings to teach the men and the junior members of the staff to grasp the necessity and value of their particular duty; and in this respect the servant of the small undertaking distinctly scores if the chief administrator is on the right lines. Thus a man pumping syphons and changing purifier-valves finds it hard to believe he is as necessary as the stoker or machine operator. Or, the boy handing out coke checks and tickets cannot readily understand which particular item in the balance-sheet represents the results of his labours.

Among the staff, the writer made a practice of passing round frequent statements or memoranda to the chief of the officials—giving particulars of the system or changes in the system. In outlining the original system, the link between each department was carefully explained, and when any changes were made, the reasons for the changes. Occasionally meetings were held in the Company's time with all the staff present; and the need was then shown for correct working. It was shown how the inter-relation of duties was necessary for the monthly costing, and how the following were linked-up: (1) Goods inwards. (2) Goods outwards. (3) Manufacturing operations. (4) Recording. (5) Allocation and costing. The general aspects of costing were discussed; its practical value was demonstrated, as apart from its academic interest; and cases were discussed in which the money spent in further refinements of the system would be larger than the possible saving.

The foremen were treated in the same manner; but in their case the subjects dealt with were the inter-relation between their processes and the transport of goods inwards, outwards, and internally. Incidentally, they were taken into confidence on the general question of costs—to show where the money was spent, and where savings had been effected, or the reverse, month by month.

Publication of Results.

The general factory results were published weekly on suitable simple charts in the messroom; and particularly good work was drawn attention to. Owing to the fact that a premium bonus system was introduced by the writer, the cash bonus at the end of the week was the best barometer for actual shop production.

With regard to the premium bonus scheme, it could always be demonstrated to the worker that he obtained 75 p.ct. or more of the labour charges saved by his efforts—making no secret of the fact that the company gained by the reduction of the overhead charges, which were heavy.

Application to Gas-Works.

Although part of the foregoing cannot be directly applied to gas-works, yet much may be done on similar lines. For instance, how many of our junior officials are aware of the structure or fabric of our immense industry? There are many interesting topics rarely touched upon in the technical associations which might profitably be taught and discussed. How we get powers, the obligations under which we work, the varying methods of administration and policy, the economic effect of changing prices, the relation between profit and capital, and many other topics too numerous to mention.

At the present moment, when change is the order of the day, do our foremen and workmen understand the calorific aspect, the reasons for reducing impurities and inerts, the developments in other works, the essential differences between water gas and coal gas, low-temperature carbonization, or the conservation of coal? Education in these and similar topics could not help but increase efficiency; and dealt with in the right manner, it would be welcomed by the men, also giving them more interest in their work, and improving their powers of observation.

Social Meetings.

Frequent staff and men's social meetings are a feature of some company's propaganda; and in the writer's case debates were held on such subjects that the workers would be sure to "let themselves go"—not too intellectual, but chosen to suit all tastes. Novelties were introduced at these meetings, and amusing competitions. Great interest was aroused at one of these gatherings by all present estimating the following: (1) The weight of a piece of concrete. (2) The cubical contents of some timber. (3) The naming of liquids and fluids in corked bottles—such as petrol, methylated spirit, beer, whisky, tea, cement, flour, &c. (4) Weights of utensils and tools handled daily. (5) Naming of languages printed on charts. On another occasion a number of subjects were put into a hat and selected men had to speak for five minutes on the subject drawn.

Such evenings as these, even among men who were ill-educated in the ordinary sense of the word, came as a refreshing change from smoking concerts and whist drives, and probably did more to foster the human touch than more formal functions.

Minor Privileges.

Many minor concessions can be given to men without costing the employer anything. For instance, goods can be purchased from the stores at cost price *plus* a small percentage for carriage and clerical work. Men should be allowed to purchase disused or derelict material never likely to be required by the works—such as old corrugated iron, timber, odd pieces of tarpaulin, and the like. The men should be encouraged to take up first aid, and taught the elements of fire drill. If a short time can be spared on suitable occasions, men will be found anxious to take these things up. Knowledge is power, and brings with it a conscious feeling of responsibility and increased value as a citizen.

When, added to the various activities mentioned, one has daily duties coupled with the innumerable forms and returns associated with Government Departments, it became difficult to keep trace of all requirements in this direction. Lists were accordingly drawn up, showing daily, weekly, and monthly reports, statements and returns fully described, with the name and address to which they should be sent, together with the official responsible for their respective preparation. It was the duty of the correspondence clerk to see that these were collected in the evening, about half-an-hour before post time, and brought to the manager's office for signature. As the number of returns of gas companies is not diminishing, this suggestion may be of value.

Many of the observations in this contribution may appear obvious or trivial; but by organization on these lines, imperfect in many ways as they are, the results effected were a large increase in output, both in bulk and per man, reduced costs in spite of increases in materials and labour, and for all practical purposes, freedom from labour troubles.

Before the Institution of Mechanical Engineers, on Friday next, Mr. David Brownlie, of Manchester, will read a paper entitled "Exact Data on the Performance of Mechanical Stokers, as Applied to Lancashire or Other Narrow-Flued Boilers."

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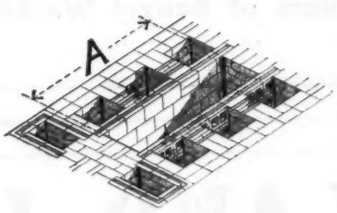

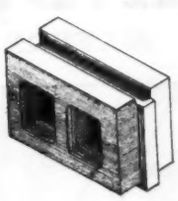

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Annual General Meeting.

THE Annual General Meeting of the Association (which was well attended) was held last Thursday afternoon, in the Grand Hotel, Birmingham. At the opening stage of the proceedings, the chair was taken by Mr. A. T. HARRIS, of Market Harborough (the outgoing President), who later gave place to his successor, Mr. JAMES R. DUFF, of Banbury. Matters before the meeting gave rise to a full discussion.

The PRESIDENT said that before the minutes of the previous meeting were read, he felt he could not allow the occasion to pass without expressing the pleasure of himself and the members at the presence of their old friend Alderman Cooper. As the senior living member of the Association, they were all delighted to see him; and he trusted sincerely that it would be many years before they would miss Alderman Cooper's presence at their meetings—if only occasionally.

Alderman COOPER (Banbury) said he thanked them very much for their kind expressions. He was only too pleased to see old faces once more. They all looked fairly cheerful after the rough winter they had gone through. He hoped they would live to see many more.

MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. W. G. S. Cranmer, of Willenhall) read the minutes of the last meeting; and they were confirmed. Apologies for absence were notified from various members, and Presidents and Secretaries of kindred Associations.

NEW MEMBERS.

Mr. John W. Allin, of West Bromwich, and Mr. George Henry Stewart, of Cannock, were elected members of the Association, on the proposition of Mr. H. HADDOCK (Atherstone), seconded by Mr. W. C. JONES (Brierley Hill).

ANNUAL REPORT AND ACCOUNTS.

The report of the Committee and the accounts for the past year were submitted to the meeting and adopted, on the proposition of Mr. B. W. SMITH (Walsall), seconded by Mr. VINCENT HUGHES (Smethwick). The Committee said it was with sincere regret that they had to record the death of one of the founders of the Association—the late Mr. William North, for many years Engineer and Manager of the Stourbridge gas undertaking. Mr. North was one of the five gentlemen who met at the Windsor Street Gas-Works, Birmingham, on Sept. 20, 1877, when it was decided to issue invitations to the managers of the Midlands to attend a meeting for the purpose of forming a District Association of Gas Managers. Mr. North later acted for a period of seven years as Hon. Secretary of the Association, in which he always took an active interest until he left the district. On his retirement from active work he was elected an honorary member.

SERIOUS COAL POSITION.

Mr. HUGHES said they were informed by the report that Mr. Goodrich, on behalf of the Controller of Coal Mines, had attended their last annual meeting, and addressed them on the question of coal stocks and prospective supplies. He had very vivid recollections of the promises he made, and the wonders he was going to perform in regard to deliveries of coal, and would now like to know whether the Committee had pursued this subject any further. They went away from the meeting to which he had referred with a very comfortable feeling that things were going to be well; and he would be glad to hear the opinions of members as to whether there had been any real material improvement in their position in the past twelve months. They had had visits not only from Mr. Goodrich, but from other gentlemen representing the Coal Controller and other Government Departments; but to his mind the whole thing had simply been a farce. It made one impatient. In his own case, if he received nothing he would not have sufficient to carry him on for more than another two days. Oil was absolutely impossible to get, while of coal one received just about one-third or one-half of what was used, and stocks were gradually dwindling away.

Mr. J. FERGUSON BELL (Derby) said he was going to suggest that they should send a communication to the Coal Controller, drawing his attention to the grave position of a large number of gas-works in the Midlands in respect of coal supplies. It was quite certain that something needed to be done. They were now faced with a possible stoppage on the part of the miners—he did not think it would come about, but still there was a threat. There was no doubt that the bulk of the Midland undertakings had been worse served than those in other parts of the country. It was only by going right away to Durham that most of them could keep on at all; and he thought they should send a strong note to the Coal Controller, stating that they viewed with great apprehension their present position in regard to coal supplies, and hoped something would be done to remedy the deficiency.

Mr. JAMES PATERSON (Cheltenham), speaking as a member of the Committee, remarked that he did not think they had taken any responsibility for the statements Mr. Goodrich had made at the last annual meeting. Mr. Hughes had evidently left the meeting with a feeling of optimism which perhaps some of them did not share with him. The Committee simply said in the report that Mr. Goodrich had attended and addressed the meeting; and if there had been any disappointment with the course of events, he did not think the Committee were to blame. As to Mr. Bell's suggestion, they had been having resolutions from the National Gas Council quite recently; and he very much doubted whether any useful purpose would be served by doing as was now proposed. They had a remedy in regard to stocks with their District Committees. ["No."] Well, they were told they had a remedy; and he could not help thinking that personal application from individual undertakings which might be suffering at the moment would probably be more effective than any joint resolution from the Association.

The HON. SECRETARY remarked that at the present time there was, he believed, a big effort being made to meet the demands of gas undertakings, certainly in their district; but perhaps some of them expected a little too much in this way. There was one thing they must bear in mind. Taking his own case—and he knew that many others were similarly situated—before the war, in 1914, they were using about 14,000 tons of coal per annum; while at the present time they required over 18,000 tons. All this extra coal had to be found somewhere; and he did not see that they could expect very much more.

Mr. HUGHES: What about the big effort that is being made?

The PRESIDENT said he was glad this matter had arisen, because he was quite in sympathy with what Mr. Hughes and Mr. Bell had said. He would like to point out to Mr. Cranmer that the large increase in the consumption of coal in gas-works to which he had referred was due to the saving of coal in other directions. Householders had in many cases come to gas undertakings because they could not get coal themselves. The matter was a vital one; and though it was true that there had already been many resolutions, the more they hammered away at the authorities, the more likely they were to get just treatment.

Mr. BELL said that what he was going to propose was that a communication be sent to the Coal Controller informing him that at the annual meeting of the Association that day the members viewed with great apprehension the diminished reserve stocks of coal, and hoped the Controller would take steps, through the Local Committee, in order that this condition of affairs could be remedied. It was not his intention to lay blame on the Committee of the Association. They and the other Committees were doing all they could. The blame really rested with headquarters. There were so many contradictory orders. First coal was sent to one place, and then to another. Those who helped themselves were more likely to be helped; and he thought if they made their position known to the public, they would stand a better chance of getting the consideration which they deserved. A large number of people were entirely dependent on a gas supply; and this more particularly applied to the working classes. The bulk of them cooked their food by gas, and very many used it for heating purposes; while great numbers of people who could not get coal had had to be supplied with coke. Mr. Cranmer had referred to gas-works whose coal consumption had largely increased. Many were using much less coal than before. He could name some large works which had saved thousands of tons, at the request of the Coal Controller, by using a greater percentage of water gas. In his own case, with an increased output, the coal consumption was down 10,000 tons. Yet they had had great difficulty in getting supplies. It was time that gas undertakings received first consideration in the matter of coal; and he hoped the meeting would unanimously agree to the sending of a strong request for such consideration. Household coal was having first thought at the present time; and no doubt some people were getting it who could well wait. At any rate, since the 10s. per ton reduction, the coal difficulty had been worse than ever before. The position was terrible, and had been for months past.

Mr. HUBERT POOLEY (Leicester), in seconding the resolution, said Mr. Bell had pointed out the saving at Derby. In Leicester, in 1913, they used 185,000 tons of coal, and last year 138,000 tons, with an increased make of 300 million c.ft. This was a saving of 47,000 tons of coal in one year; and the year before that they saved to the country 40,000 tons. The result was disastrous, because the quality of the gas supply was certainly greatly wanting. He grumbled particularly because the Coal Controller still placed household coal before gas coal; and he would like to add to the request that gas coal be given preference over house coal.

Mr. BELL intimated that he would accept this.

Mr. HUGHES said it had been remarked that they had some sort of remedy with their Local Committees. A few weeks ago, a small deputation from his Corporation waited upon Major Selby Gardner, the Secretary of the Coal Supplies Committee, No. 9 District, to point out the serious position in which they were; and all he could tell them was that he was at the mercy of the Government. Each Committee was looking after its own particular district; and he was quite sure in his own mind that the gas coal supply in the Black Country was inadequate. Another thing he (Mr. Hughes) would like to ask was why they were receiving

what was called house coal, or bunker coal, or anything else that was black. As far as gas making was concerned, they might just as well have paving-stones sent them. The thing was too ridiculous for words; and unless they expressed themselves strongly, they would all be in the dark, and the poor gas managers would have to bear the blame.

Mr. C. M. D. Belton (Shrewsbury) supported the resolution, because it was necessary to keep on sending resolutions. Some of them had heard one of the high officials deplore the fact that gas-works were using so much coal, and robbing the household consumers. If this was the attitude that was taken up in London, no wonder their position was so precarious. They knew how badly he, for one, had been treated. Fortunately, he had been able to put in a water-gas plant at the beginning of this year; but since then undue advantage had been taken of this fact, and he was worse off than ever.

The President remarked that Mr. Belton had shown the ignorance of the authorities in dealing with this subject. If people were not able to get gas, the country would be at a standstill. The sooner this was made clear to all, the better it would be. The resolution should go to the Coal Controller, and not to the National Gas Council. The Council had done their best; but if they went to the fountain head some notice would have to be taken of their communication, and he hoped the necessity for action would be recognized.

Mr. W. C. Jones suggested that members should send copies of the resolution to their representatives in Parliament, and ask them to do what they could to improve the position. Unless they did this, the result would be the same as it had been all along. Especially should this course be taken by those who had Labour members of Parliament.

Mr. Paterson: The more people who get to know of it, the better.

The resolution was then unanimously agreed to.

Report of the Commercial Section.

Mr. Pooley, submitting the report of the Commercial Section, said the work done during the year had, he thought, been useful. There was a movement towards co-operation with the District Executive Board of the National Gas Council; and the little that had been done in this direction was beneficial. All sorts of topics had been brought up for discussion—coal, of course, being prominent among them. The state of the residual markets had been very peculiar. There had been all through the year a great shortage of coke. The tar market had been booming; and sulphate of ammonia prices were, of course, practically controlled.

The President, in moving the adoption of the report, said he was sure the section had been of great use to many undertakings; and they owed their thanks to Mr. Pooley for the valuable information he had given them from time to time. They were glad to know he was at the head of affairs for another twelve months.

Mr. Haddock seconded the proposal, which was agreed to.

Representative on the Institution Council.

On the motion of the President, seconded by Mr. Pooley, Mr. Duff was elected representative of the Association for the ensuing year on the Council of the Institution of Gas Engineers.

Reports of District Associations.

The President, referring to the 1919 volume of "Reports of Proceedings of District Associations," said that relatively only a small percentage had been purchased at the special price through the Association. The result was that the Secretary had many copies on hand. With regard to the coming year, it was difficult to say anything definite. The cost of printing and preparing the book had increased largely; and, from what he had gathered, it was possible that the volume would not be forthcoming for the current year. In any case, he took it they would be notified by the Secretary, and then at a later meeting they would have to decide upon a course of action. Personally, he should deplore the loss of these reports, even if to secure their continuation it was necessary to have what might be termed a "whip round." They were useful to everybody; and he did hope that some means would be hit upon to prevent any cessation of publication. In the event of the price going up, he trusted the members would give the necessary support to ensure continuation of publication.

Mr. Bell corroborated what had been said as to the value of these "Transactions." As they ought to be in the office of every gas undertaking, he took it that it was a matter for the undertakings themselves to see that they were purchased. He also would deplore the cessation of publication, even for a single year, and he hoped there would be such a response as would induce the "Gas Journal," who had published the reports now for many years, to continue the work. The volumes contained the proceedings of the Associations throughout the country, and were therefore most valuable as a work of reference. He would certainly be glad to pay any extra sum that was necessary; and he fancied most of the undertakings would be quite willing to meet any small increase, so that the reports should continue to be available.

The New President.

The President said he now came to the most pleasant part of his duties, and the close of his year of office. He had to invest Mr. Duff with the badge of office as President for the coming year. He did not need much introduction to the members; for he was a man they had always admired and respected. In asking him to take the chair, they would be adding to the prestige and usefulness of the Association.

Vote of Thanks to the Late President.

Mr. James R. Duff (Banbury) then took the chair, amid applause, and proceeded to propose a vote of thanks to Mr. Harris for his services during the past year. He had filled the chair with great satisfaction to all of them.

Mr. Paterson seconded the resolution, which was heartily passed.

Mr. Harris, in acknowledgment, regretted that, owing to circumstances over which he had no control, he had been unable to extend an invitation for the summer outing. Coming, as he did, from an old gas family, and occupying a humble position in the industry, he very greatly appreciated the honour the Association had conferred upon him. One word he wished to say was that he felt, if they did not have more active members they would be outstripped by the Junior Association. Nothing had given him greater pleasure than to read of the meetings the Juniors had held, and to see the high quality of the papers that had been read. He would like to impress upon the younger members of their own Association the imperative necessity of their coming forward and giving of their best in the way of papers and discussion. There never was, both on the technical and business sides, more material available.

Mr. Duff then proceeded to deliver the following

PRESIDENTIAL ADDRESS.

My first duty must be that of expressing my sincere appreciation of the honour you have conferred upon me in electing me as your President—an honour which I esteem in the very highest degree, because it has always been my ambition (as it should be every young engineer's) to occupy one day the coveted position of the presidential chair.

On looking over the roll of Past-Presidents, which contains the names of many distinguished men who will leave their mark imprinted on the destinies of the important industry in whose interests we are all personally concerned, I must confess to a very real sense of misgiving; and although my endeavours to uphold the prestige of the Association and to emulate my predecessors in this chair must necessarily be inadequate, I trust that, with your assistance, and particularly that of our esteemed Hon. Secretary, my efforts may not prove wholly unacceptable to you, and that the proceedings of the Association may be profitable throughout the year.

The preparation of the Presidential Address is always, I fancy, a formidable task. Whether it is the overwhelming feeling of responsibility which is indefinably felt as attaching to words from the chair, or the variety of subjects to be treated of, in any case it is not work which can be lightly approached. At the present time, the difficulty of focussing one's ideas appears to be greater than usual. Whether we confine our thoughts to our own particular industry, or consider it in relation to other industries, or in relation to municipal enterprise and social welfare, or in relation to national methods and recent criticism—from whichever point of view it is regarded, there is consciousness of impending change, and the necessity of readjustment of old ideas and theories.

Keeping Abreast of the Times.

It should be the ambition of each one of us to try to improve ourselves and all with whom we come in contact; and I am convinced that this can to a certain extent be attained by meetings such as ours, where we can come together and exchange views on our daily work, and have the experience of others who, perhaps, are better able to give, because of the magnitude of the works under their control. I am confident that such men are always willing to help their fellows; the ultimate result being that the undertakings—whether owned by corporations or by companies—we have the honour to serve get the benefit of such exchange of opinions and ideas. The Commercial Sections of the various Associations have done yeoman service in this direction; and it is a short-sighted policy not to take full advantage of the opportunities that these sections present. We may not agree with all that is done, or the manner in which it is done; but it is most essential at the present time to keep in close touch with everything appertaining to our industry. Things move so quickly, and changes are of such a rapid nature, that no engineer can afford to sit down and let things slide, if he is to keep his undertaking abreast of the times.

My experience with the gas industry ranges over a period of thirty years, commencing in a very humble capacity with the Morecambe Gas and Light Company, where my father was Engineer and Secretary for nearly forty years. The Company was taken over by the Morecambe Urban District Council on July 10, 1900. On the resignation of my father in 1902, I had the honour of being asked to take the control of the works. Although the capital charges were as high as £2176 per million cubic feet, I had the satisfaction of being able, in five years, to work up the undertaking to practically meet the liabilities in the shape of interest and sinking-fund charges.

Early Experiences at Banbury.

In 1907, my sphere of labour was transferred to the Banbury Gas Light and Coke Company, where I have the honour of control at present—a rather unique experience, coming from a works with a capital of £2176 per million cubic feet of gas made, to one with the low capital of only £310 per million. When one has to begin the year's work with a deficit brought forward, it makes it a heartbreaking drag, but at the same time brings-out in

a man the grit and the will to succeed. The Banbury Gas-Works are owned by a Company which was formed in 1833; and it is rather interesting to set out the first prospectus of the Company, which was as follows:

PROSPECTUS for Forming a Company to Light the Town of Banbury with Gas, August, 1833.

The demand for gas as a material of light and heat is annually on the increase; and it may now be considered rather as a necessary than as a luxury of life. This circumstance, and the handsome and certain return which nearly all the gas-works in the kingdom are now paying, have rendered such investments more desirable even than the public funds; and with the conviction that Banbury will be found as profitable for such a speculation as any town of its size, the following statement is submitted to its inhabitants.

An estimate of the cost of erecting works and laying-down mains has been made, from which it appears that the capital required will be £3500, which it is proposed to raise in 140 shares of £25 each, though it is likely that the total expenditure will not exceed £3200.

The shops, inns, and other private consumers will require 300 lights; and 70 public lamps will light the town in a very respectable manner.

It is proposed to supply all private consumers by measure only, at 15s. per 1000 c.ft. This system is the most equitable and economical for all parties, as the consumer then burns when he pleases, and pays only for what he burns, without being taxed for the loss occasioned by extravagant consumers—so numerous when the system of contracting at a price per burner is adopted.

The sum at present paid by the Commissioners for lighting the oil-lamps of the town will be sufficient to cover the cost of 70 gas-lamps burning for 140 nights per season.

Taking the above as data upon which to found a calculation of the annual expenses of returns of the concern, the following is the result:

Expenses.

	£	s.	d.
220 tons of Derbyshire coal at 18s.	198	0	0
60 tons of Staffordshire coal at 16s.	48	0	0
Wages of two men, 52 weeks at 15s.	78	0	0
Lamplighter, 25 weeks	15	0	0
Salary to Superintendent	50	0	0
Lime for purification	20	0	0
Wear and tear of apparatus	40	0	0
Stationery, stamps, and incidentals	40	0	0
	£489	0	0

Returns.

	£	s.	d.
936,000 c.ft. of gas sold to private consumers at 15s. per 1000 c.ft.	702	0	0
70 street lamps	135	0	0
990 quarters of coke at 3s.	148	10	0
	£985	10	0
Deduct cost	489	0	0
Balance of profit	£496	0	0

Abundant evidence can be produced, that such calculations have in other towns been found correct in practice.

It is presumed that there is sufficient spirit in Banbury to prevent such a concern being carried into operation by capitalists having no connection with the town. If the present proposal can be carried into effect, all the advantages may be shared with the tradesman having £25 to invest; and as the instalments of £2 10s. per share will be spread over a period of twelve months, inconvenience can be felt by none. The inhabitants may be assured that if not brought forward by themselves at an early period, some enterprising individual will not be long before he secures to himself the advantage which should be enjoyed by them.

Books are open to receive the names of subscribers at the bank of Messrs. Cobb and Co. and Messrs. Gillett and Tawney; and when the shares are taken, it is proposed to call a meeting of the subscribers to form a Company and appoint proper officers.

This Company carried on business, not on the site of the present works, but in the town. The works were erected on the present site, between the London and North Western Railway and the Great Western Railway, about the year 1856. The Company applied for statutory powers; and the Bill received the Royal Assent on April 30, 1866, since which time the Company has worked under the Act. The capital duly authorized is £10,000 of ordinary shares, £20,000 of new shares, and £7500 loan. The whole of the share capital has been issued at par to the shareholders, and £3000 on loan has been raised—a total capital charge of £33,000. Since I took charge of the works the increase in gas consumption has been rapid, and the works have been remodelled and improved to meet the increases.

RECONSTRUCTION WORK.

It may be of interest if I give a *résumé* of what has been done during the twelve years I have had charge of the undertaking. The first thing to be tackled was the problem of dealing with the ammoniacal liquor. A very poor price indeed was received for the liquor; and I advised my Directors to erect a sulphate plant. The plant decided upon was one of C. & W. Walker's, capable of producing a ton of salt per diem. The result after the first year's working was more than satisfactory. But we had trouble with the Thames Conservancy Board respecting effluent escaping into the River Cherwell. This was overcome, however, by redistilling the devil liquor, filtering the effluent by passing it through coke breeze, and afterwards using it for quenching purposes.

The next departments to be tackled were the retort-house, purifying plant, and boilers. Steam pumps had never been used on the works until I introduced them; tar and liquor pumping into railway tanks, &c., being done by hand. This was soon remedied. The boilers, however, being only 10 ft. by 3 ft., under-fired, were not large enough for the work, and were very wasteful in fuel.

The retort-house was tackled first—this being where money is made or lost. Contracts were let to Messrs. Drakes, of Halifax, for the installation of four through beds of eights, 16 in. by 22 in., 20 ft. long, ⏢ section; each retort being divided in the centre by ⏢ blocks, which could be removed in the event of machinery being introduced. The foundations were put in under rather precarious conditions, as we were obliged to work the old plant under the same roof. This was rather an anxious time; but it was overcome, and the retorts were brought into action without a hitch. The hydraulic is fitted with Cort's anti-dip pipes and valves; and a Braddock retort-house governor regulates the pull upon the hydraulic. The exhauster is governed in the engine-room, so that the result is practically a level gauge line. Whatever pull is required can be obtained by weighting the retort-house governor from the retort-house floor.

The purifying house next occupied my attention. There were three boxes—two 14 ft. square by 4 ft. 6 in. deep, and one 12 ft. square by 4 ft. 6 in. deep—all having water lutes. The new house I designed to take four boxes, 15 ft. by 20 ft. by 5 ft. deep, with Green self-sealing covers. For the two catch boxes I utilized the two 14 ft. square old purifiers; making these into luteless covers by filling in the water-lutes with concrete, and inserting rag bolts for holding-down the covers. The joint was made of hemp well soaked in tallow, bolted on to the old covers, which had had the sides removed and an angle curb riveted on to form the stiffener for the cover. This joint has proved to be very efficient, and has given no trouble whatever. Of course, it must be borne in mind that these catch boxes are not opened so frequently as are the other four.

Two Cornish boilers, 20 ft. by 6 ft., were installed on the site of the old purifying house, in place of the old under-fired type. The consumption of gas was now increasing rapidly, owing to the pushing of the use of cookers, gas-fires, &c.; and it thus became necessary to increase the retort power. We therefore decided to add three beds of eights, instal stoking machinery, and erect a new chimney. The bench was undertaken by Messrs. Drakes, Limited, and the stoking and coal handling plant by Messrs. Aldridge and Ranken. It was necessary to raise the two roofs of the retort-house 5 ft. to get in the Fiddes-Aldridge machine. This was successfully carried out, though we had great trouble with the chimney foundations, which eventually had to be piled.

The electric generating plant consists of a "National" gas-engine directly coupled to a dynamo. There is no stand by; but a spare armature is always kept ready in case of a breakdown. A spare motor also is provided for the charging machine.

The charging machine carries its own coal, sufficient for ten retorts. We have no storage hopper, which is, of course, a drawback, as a considerable amount of time is lost in filling-up the hopper with coal after each draw.

We found on changing-over from hand stoking to machine stoking that stopped pipes were frequent—in fact, I found at times every retort in the house blowing; and it kept a gang of pipe jumpers busy. This trouble was overcome by running a small stream of water into the ascension pipes, when our troubles in this direction ceased entirely.

The coal-crushing plant was in the first place designed to be driven by a 13 H.P. electric motor with the ordinary knockout switch and safety fuses; but we discarded this, owing to the numerous breakdowns that we experienced. It was placed in the breaker pit, which was anything but a satisfactory position, in the damp and coal dust. This motor was replaced by a compound steam-engine standing above the coal-breaker on the ground floor, and connected by a chain drive. If any foreign substance gets into the crusher, it pulls up the engine before any damage can be done, as the reserve power of the engine is very small.

The holder capacity was now getting too small (being only for 170,000 c.ft.), so it was decided to increase the storage of a single-lift-holder, 70 ft. by 20 ft. deep. This was converted into a three-lift holder, with lattice girder standards, to contain 200,000 c.ft. The brick tank was not altered, with the exception of the foot-stones in the bottom of the tank.

The condensers, formed of 8-in. cast-iron pipes, were replaced by a set of four annular tubes with 12-in. connections and by-pass valve.

Two new exhausters, replacing the old plant, which was belt-driven and always a source of anxiety, were put in with steam-engines direct-coupled. The station meter was replaced by a rotary meter capable of passing 50,000 c.ft. per hour.

A water gas plant, by Messrs. Humphreys and Glasgow, capable of producing 200,000 c.ft. of gas per day, was erected during the war, in order to cope with the great demand for gas made by the National Filling Factory which was established about a mile from the works. A 6-in. main was run direct from the gasholder, with a pressure of 8 in., to the factory; and the gas was there boosted to 20 in. pressure by electricity.

After putting the works in order, it naturally followed that the distribution side of the undertaking would require some attention. The mains generally were very small, and not in a very good condition. The pressure was a varying quantity, especially at peak load. This we remedied by putting in a small high-pressure plant carrying a 3 in. steel feeder to the centre of the town, and governing-down from 60 in. pressure to 4 in. This plant has

since been utilized for supplying two villages some six miles from the works, and also supplying the United District Gas Company with gas in bulk to their holder at Adderbury, also six miles from our works. The high-pressure gas is governed-down to 4 in. at the entrance of each village, and does away with the necessity for a storeage holder. The arrangement has worked very satisfactorily for the past six years. The plant is run each day up to 20 in. pressure at the works, and increased to 60 in. at lighting-up time. At midnight, the plant is shut-down, and the bye-pass automatically acts; the ordinary town pressure being sufficient for the needs of the consumers until sunrise.

Slot meters and cookers were pushed; and though the income from this source in 1907 was only £828 per annum, it has gradually increased until, for last year, the income reached the figure of £7166. The slot installations consist of meter, cooker, one pendant, and one bracket, with free piping up to 30 ft.

We have a maintenance system of incandescent lighting, also a regular inspection of cookers and fires. This is of great benefit to consumers, and, in my opinion, is a necessity from the gas distribution point of view. Many a complaint of bad gas is avoided by this periodical inspection; and it is certainly much appreciated by consumers. I admit the expense is rather heavy. But against the cost one has the satisfaction of the consumers; and I think the advantage lies with the gas company.

An Invitation to Banbury.

In conclusion, I have pleasure in extending to the Association a very hearty invitation from my Directors to visit the old town of Banbury, where an inspection of the works can be made; and I have no doubt we shall be able to arrange a pleasant and profitable day's meeting.

The President Thanked for his Address.

Mr. Pooley, proposing a vote of thanks to Mr. Duff for his address, remarked that, like his predecessor in office, he was a member of an old family of gas managers. His experience at Morecambe, handicapped as he was by a very heavy capital, would be a very valuable asset in his life's work. They were indebted to him for placing on record the prospectus of the old company at Banbury. Referring to rates of wages, which had now become such a burning question with them all, he would like to relate an experience of his own. He was privileged about fifteen years ago to meet an old employee of the Stafford Gas Company, who fifty years before this time was employed there at 2s. per shift, thus earning 14s. a week. This old man, as he knew him, was a respected member of society, who had somehow saved a competence—though goodness only knew how—for his old age. It seemed to him that this man should stand out as an example to present-day workers of what could be done in the past on a mere pittance. Mr. Duff's free relation of his experiences at Banbury would be very useful to many of them.

Mr. Bell, who seconded, took the opportunity of congratulating the President on being engineer of a works where the capital was as low as £310 per million c.ft. Mr. Duff must, he said, have found a great difference between £2176 per million at Morecambe and only £310 at Banbury. He had just worked out what the charge would be, supposing 5 p.ct. interest was paid in each case. At Banbury it would amount to 3¾d. per 1000 c.ft., and in the other case to 1s. 10½d. This showed the enormous advantage of having a low capital account. He was glad the people of Banbury were wise enough to form a local Company. It was well known that they had been admirably served both by Alderman Cooper and his successor. The President had shown them how a medium-sized works could be modernized without incurring any excessive capital expenditure. This was what they all ought to bear in mind—especially at the present time, when prices of everything were so enormously high.

Mr. Duff, in response, said his Directors felt it a very great honour that he should have been asked to take the chair of the Association, particularly as it was the second occasion on which the engineer of the Banbury Gas-Works had been their President. His old friend Alderman Cooper, it would be remembered, was President in 1896. When the Association visited Banbury, they would try to make the outing enjoyable and instructive.

The Secretaryship of the Association.

Mr. Harris said it was only by exerting great pressure that they had induced their Hon. Secretary to remain in office; and then he did so on the distinct understanding that he was to be relieved of the duties during the current year. Mr. Cranmer would soon have finished his seven years of office; and he hoped there would be no difficulty in securing a successor.

Gas and Housing Schemes.

Mr. R. J. Rogers, the Fittings Superintendent to the Birmingham Corporation Gas Department, then opened a discussion on "Gas and Housing Schemes," which is reported on p. 635.

When the time arrived to adjourn, it was felt that the subject had not been nearly thrashed out; and it was agreed that Mr. Rogers should reply to what had already been said, and that the debate be continued at a future meeting of the Association.

Members then took tea with the President, who was thanked for his hospitality, on the motion of Alderman Cooper.

At this stage of the proceedings, it was intimated that Mr. Herbert Stevenson was taking up the position of Secretary of the National Association of Technical Gas Officials.

INDUSTRIAL APPLIANCES AT GOSWELL ROAD.

Inspection by the London and Southern District Junior Gas Association.

Last Saturday afternoon was both profitably and pleasantly spent by a large party of members of the London and Southern District Junior Gas Association in inspecting the contents of the industrial appliance show-rooms and demonstration workshops of the Gas Light and Coke Company in Goswell Road. They were accompanied by the President (Mr. S. B. Chandler), and on arrival were received by Mr. B. W. Brooks (the Company's Technical Representative), who conducted a number of tests, and, with the aid of Mr. H. W. Grover and other assistants, fully explained the various processes and apparatus to which the visitors were introduced. It was not the members' first visit, for they were at Goswell Road a little over four years ago, at which time Mr. Brooks read a paper before the Association, on the "Application of Gas to Industrial Purposes." Bearing in mind what they had seen before, those who took part in both visits were able to note the improvements that had been made in the intervening period. So that all might see and hear what was going on, the visitors were divided into two parties; the demonstrations being repeated for the second party.

The appliance room, which was specially constructed, occupies a floor-space of 1250 sq. ft., and has a glass roof. Adjoining is the engine and compressor house. The installation consists of a 6 h.p. Hornsby "Stockport" gas-engine, driving a main shaft, a Worthington reciprocating pump-acting compressor to supply gas up to 15 lbs. pressure per square inch, a 1000 c.ft. Keith rotary compressor for supplying gas or air at 4 lbs. per square inch, and a No. 2 standard Keith high-pressure air blower, capable of supplying 30,000 c.ft. of air per hour at 8 in. water-gauge pressure. The inlet and outlet pipes of the compressors and leads to the various furnaces are painted different colours; and by referring to the gauge-board, one is readily able to ascertain the pressure at which each appliance is working. There are two 200-light dry meters, on the floor, so as to enable customers to check the indices while tests are in progress. They are fitted with bye-passes and pressure-gauges on the inlet and outlet connections; one meter supplying the natural draught and the air-blast furnaces, and the other high-pressure gas. All piping is of wrought iron, and is carried round the wall on wrought-iron hangers about 2 ft. from the floor level. Starting from the top, there is a 2-in. pipe painted vermilion red, supplying gas at 14 lbs. pressure; a 2-in pipe painted deep red, supplying pressure gas or air at 4 lbs. per square inch; a 3-in. pipe painted green, supplying low-pressure gas; and a 4-inch pipe painted white, supplying low-pressure air.

It is possible to mention here only a few of the appliances to which the attention of the visitors was drawn. Some brazing was done in a forge of their own design. Two pieces of 1½ in. by ½ in. bar iron were brazed together in two minutes, from a cold furnace. A 1-in. tool was heated from a cold Richmond high-speed tool furnace in six minutes. Then Mr. Brooks showed a new internal heater, working on natural draught, for heating solutions in lead-lined vessels. There were also two new forms of appliances, for heating rollers of mills—one externally heated by deflection, with natural draught burners. The other one demonstrated the use of gas for heating internally a roller 8 ft. long, having a bore of only 3 in. diameter. Perfect combustion takes place right through the roller, giving a uniform surface temperature. This is brought about by using an air-blast burner, and by sending into the roller bore under pressure a small jet of air to clear away the products of combustion and to supply a certain amount of secondary air.

The "B.W.B." Soft Metal Furnace.

One of the things which attracted most attention was Mr. Brooks's new system of down-draught furnace, with ½ ton pot, for melting stereo and soft metals generally. The principle of this is that the flame cycles downward, aided by a draught which is created on the flue by a pilot. One advantage of this method is said to be that it gets over the trouble of breaking the pots; and another, that the metal can be worked with a pre-determined temperature. During certain periods the gas can be completely turned out, because the pot is surrounded entirely by brickwork, which conserves sufficient heat to enable the metal to be kept at a working temperature for more than a hour after the gas has been turned out. In connection with this furnace, the figures on next page may be quoted.

The "B.W.B." Oven-Furnace.

The visitors also saw the new natural draught "B.W.B." oven-furnace for heat treatment purposes, 24 in. deep by 9 in. wide by 7 in. high, with a gas consumption of 300 c.ft. per hour. In this a 4·7 shell has been heated to 2000° Fahr. from a cold furnace in 1¼ hours; all pyrometer readings being taken from inside the shell, so as to avoid flame-contact. In a standard type of furnace, with a like gas consumption, the shell was only heated to 1200° Fahr. in the same time. Another interesting point about this test is that, after the "B.W.B." furnace had been alight for 1¼ hours, the doors were removed, and the furnace continued to make heat until it reached 2180°; but the standard furnace, when the doors were removed, maintained a level reading for three-quarters of an hour, and then gradually crept up to 1540° Fahr. At the time the

Test with "B.W.B." Down draught Furnace for Melting Soft Metals. Fitted with Natural-draught Burner. Working Pressure, 40-10ths.

Time.	Gas Consumption.	Temp. °Fahr.	Remarks.		
8.20		..	1206 lbs. of lead in pot. Gas rate at start 266 c.ft. per hour.		
8.50		260			
9. 5		400			
9 20		650			
9.35		660	Casted.	Put in.	
9.45	377 c.ft.	730	40 lbs.	39 lbs.	
9.50		740	97 ,,	38 ,,	
9.55		730	38 ,,	85 ,,	
10. 0	50 ,,	744	37 ,,	51 ,,	
10. 5		744	66 ,,	47 ,,	
10.10		740	33 ,,	..	
10.15		740	35 ,,	70 ,,	
10.20		730	37 ,,	68 ,,	
10.25		732	..	34 ,,	
10.30		734	37 ,,	..	
10.35		740	37 ,,	40 ,,	
10.40		744	37 ,,	37 ,,	
10.45	98 ,,	748	37 ,,	37 ,,	Turned out.
Hrs.Mns. 2.25	525 c.ft.		531 lbs.	546 lbs.	

Test with Standard Type of Lead-melting Furnace Heated by Four Standard Pattern Furnace Burners underneath. Working Pressure, 40-10ths.

Time.	Gas consumption.	Temp. °Fahr.	Remarks.		
8.15		..	1206 lbs. of lead in pot. Gas rate at start 334 c.ft. per hour.		
			Casted.	Put in.	
9.50	528 c.ft.	730	..	..	
9.55		750	38 lbs.	36 lbs.	
10.0	34 ,,	760	..	43 ,,	
10.5		750	41 lbs.	45 ,,	
10.10		750	41 ,,	35 ,,	
10.15		740	34 ,,	38 ,,	
10.20		730	33 ,,	48 ,,	
10.25	48 ,,	720	37 ,,	36 ,,	
10.30		720	33 ,,	56 ,,	
10.35		720	34 ,,	43 ,,	
10.40		724	36 ,,	44 ,,	
10.45		726	36 ,,	51 ,,	
10.50		732	38 ,,	..	
10.55		740	41 ,,	36 ,,	
11.0		750	35 ,,	..	
11.5	116 ,,	756	54 ,,	55 ,,	
Hrs.Mns. 2.50	726 c.ft.		531 lbs.	546 lbs.	

doors were removed the temperature of the "B.W.B." furnace was 1730°, and that of the standard furnace 1380° Fahr.

THE "G.R." FORGE.

The following figures were quoted by Mr. Brooks in connection with the "G.R." forge, which is suitable for heating high-speed steel tools, &c. The hourly gas consumption is approximately 180 c.ft. Under test, two pieces of steel 6 in. by 2 in. by 1 in. were heated in 15 minutes. One piece of 1½-in. mild steel was nosed with a piece of high-speed steel ½-in. thick in 10 minutes; this time including the pre-heating and brazing. A ¾-in. high-speed steel tool was heated in 2½ minutes from cold, with a consumption of 10 c.ft. of gas; and the second tool in 1 minute.

A similar type of forge was designed for heating iron bars 12 in. long by ¾ in. by ½ in. rectangular section used for the manufacture of horse-shoes. With a gas consumption of 300 c.ft. per hour, one operator, working ten hours, produced 1000 shoes. With a coke-fired forge, the maximum number per operator per hour was 20 shoes.

SUGAR BOILING, &C.

Other demonstrations were with a Richmond high-speed steel furnace, a Fletcher-Russell high-speed steel furnace, a sugar-boiler, a special apparatus for toasting caramels, and a brass melt of 50 lbs. in a John Wright crucible furnace. The Company have, Mr. Brooks said, been very successful with sugar boiling; there being several installations working. In one case with five furnaces there is an output of twenty boils per day per furnace.

ANNEALING GLASS.

Another industrial use for gas to which Mr. Brooks made reference was the annealing of glass, in which direction he has been experimenting. As the result of research, he has found this to be quite feasible. As a matter of fact, the lines on which he is working are quite different from those followed in the glass trade. A large quantity of globes have been annealed by the new process; and, so far as he knows, not one of those annealed five or six weeks ago has yet given way. They could take globes, pass them through their process, and they could be on a lamp within forty minutes of the time they were received for annealing. Another point is that this method of annealing brings out defects in the glass, so that faulty globes can be at once rejected. In the gas process, the glass is soaked in heat, which Mr. Brooks maintains is the correct way to anneal. Possibly on some future occasion, he said, he might be able to show the members some tests, and specimens of glass that had been treated.

At the conclusion of the demonstrations, the visitors were taken in hand by Mr. B. H. Walters (the Inspector-in-Charge at Goswell Road), who conducted them over the spacious stores, show-rooms, and offices. This was followed by tea and a return to the demonstration room, where the President said it would be agreed that the visit had been both instructive and interesting, and that Mr. Brooks and his assistants had done all they could to make it the success it had been. One of the appliances that had most appealed to him was the lead-melting pot, which he understood was Mr. Brooks's own invention. It would appear from tests of the apparatus, which was heated from the top downwards, that its efficiency was higher than that of an ordinary lead-melting furnace, where the heating was from the bottom. The question of gas-furnaces had a day or two before been dealt with by Mr. H. M. Thornton, in a paper read before the Society of Arts, in which the author pointed out the high degree of accuracy that could be obtained in metal melting and heat treatment by gas. They had just seen gas applied very successfully on a large scale for these purposes. Mr. S. A. Carpenter (Mill Hill) proposed a hearty vote of thanks to Mr. Brooks, Mr. Walters, and their assistants, for all the trouble they had taken, and to the Gas Light and Coke Company for the hospitality and kind consideration which they invariably extended to the Association. The vote was seconded by Mr. J. R. Gale (Mill Hill), and acknowledged by Mr. Brooks and Mr. Walters—who remarked that the Company were doing all they could on the industrial side. What the members had seen that afternoon was only a part of it.

Large-Scale Heating in Baltimore.

Just four years ago, the Consolidated Gas, Electric Light, and Power Company put into operation a new system of rate schedules, which provided for a secondary rate of 35 c. per 1000 c.ft. for all gas sold in excess of a certain amount per month. This amount was known as the customers' "primary rating," and was determined in the case of a domestic customer by the number of rooms in his premises, and for a commercial customer by his maximum hourly consumption. Later provision was made for basing the primary rating of customers heating large commercial buildings upon the square feet of floor area in the buildings. This very low rate for excess gas consumption made it possible to undertake the heating of buildings on a big scale, and in competition with coal-fired furnaces and boilers. In an account of the development of the scheme, which appears in the "House Heating Issue" of the New York "Gas Age," Mr. Thomson King says the first thing done was to rent two dwelling-houses, and begin a comparative heating test. The conclusions arrived at as to appliances and operating costs were used in giving estimates to prospective customers. In 1916, there were 89 central gas-fired installations put in, under a guarantee of refund in case of dissatisfaction; and only one of the number was subsequently removed. The following year saw 412 installations made; and they were subjected to a severe test with the coldest weather experienced for a century. At the end of the season, the demand for gas heating was growing by leaps and bounds. Conditions in 1918 compelled refusal of large heating business; but 1919 saw the resumption of installation work, and it is no longer necessary to advertise or to make any special guarantee on a gas-furnace. The secondary rate for gas was raised to 50 c. per 1000 c.ft. at the end of 1918; but the present prices of hard coal make the relative cost of gas heating, if anything, more favourable to gas than it was in 1916. When gas is burned with a really efficiently designed boiler, 32,000 c.ft. of 550 B.Th.U. gas is found by the Company to be the equivalent of a long ton of hard coal burned in a standard coal furnace. The fact that the equivalent on a straight B.Th.U. basis would be about 48,000 c.ft., demonstrates the greater efficiency of gas-fired systems.

Yorkshire Junior Gas Association Visit.—Arrangements have been made for members of the Yorkshire Junior Gas Association to visit next Saturday afternoon the meter, stove, and stores department of the Leeds Corporation gas undertaking. The Superintendent (Mr. T. Went) will endeavour to have a few men at work, so that they may demonstrate any points of interest.

Fuel Production and Utilization.—Acknowledgment is made of the receipt from Messrs. Baillière, Tindall, & Cox, of No. 8, Henrietta Street, Covent Garden, of a copy of "Fuel Production and Utilization," by Dr. Hugh S. Taylor, Assistant Professor of Physical Chemistry at Princeton University, New Jersey. The volume is one of the "Industrial Chemistry" series, edited by Dr. Samuel Rideal, F.I.C., which is prepared with the object of furnishing a comprehensive survey of the chemical industries. The volume now to hand is, the author says, addressed more especially to the young college graduate, as an effort to supplement his academic training with the broad facts of the problem of fuel production and utilization. It attempts to present a survey of the whole field of fuel as the author has learned it to be in the last few years, when the stress of circumstances has turned men's activities from the more specialized problems of pure science. The price of the book, which is illustrated, is 10s. 6d. net.

GAS IN RELATION TO INDUSTRIAL PRODUCTION AND NATIONAL ECONOMY.

At the Meeting of the Royal Society of Arts last Wednesday—Sir Robert A. Hadfield, Bart., D.Sc., F.R.S., in the chair—Mr. H. M. Thornton read a paper on the above subject. Prior to the paper (which was illustrated by a large number of lantern slides), the Chairman made a few remarks.

Illness of the President of the Institution of Gas Engineers.

The Chairman said, before he called upon Mr. Thornton, he was sure those present would wish him to make some reference to the serious time through which one of their great gas engineers—Sir Dugald Clerk—was passing. They would regret to hear he was seriously ill. He (Sir Robert) thought they would all agree with him that they should send Lady Clerk their sincere sympathies, with the hope that Sir Dugald would soon be well again.

THE NEED OF FUEL ECONOMY.

In calling upon Mr. Thornton to address them, he would like to say that the importance of economizing our fuel supplies, and making the best of the means of producing what was called heat was shown by the latest statistics available. For example, the President of the British Association at Bournemouth mentioned that the latest estimate of the total water-power in the British Isles was only 1½ million horse-power and that England only possessed 1 p.ct. of the water-power, and only 2½ p.ct. of the total coal, in the world. While this was startling, it helped to show how they should use all endeavours to save fuel consumption, and that they must make the consumption of as great efficiency as possible. "Many a mickle makes a muckle;" and so in the technical world, by paying attention to small things, they were able to economize, and make the most of what had been given to them by Providence. Many propositions had been suggested—for example, the late Mr. B. H. Thwaite very strongly put forward (and there was some reason in his contention) that power should be developed at our coal mines *in situ*. Why haul coal from the pit in which it was found, and spend lots of money distributing it when central power stations could be provided close alongside the coal that was at the bottom of the shaft, and out of the way of hostile aircraft? This seemed very attractive, and yet it was thirty years since Thwaite and others put forward the suggestion; and he was not aware of a single instance of this being done, at any rate on any large scale. Sir Charles Parsons had suggested boring a hole into the crust of the earth to a depth of 10 or 12 miles, with a view to obtaining what might be termed the earth's latent heat. Although there was probably nothing insurmountable in the proposition, it was doubtful whether for a long time to come this scheme would be actually tested in practice. One might run through a whole gamut of suggestions, many of them apparently containing the germs of important economy. Still nothing was done. If it took our country generations to settle down to such a sensible project as having a Channel Tunnel, how long would it take to consider the excellent suggestion of Sir Charles Parsons. They were ready to waste millions annually in wild-cat schemes, and in many cases they often rejected the views of the wise men among them. In any case, however, they could try to effect economy in present practice. In this respect, he thought Mr. Thornton had done great work by means of his lectures, and the products of his firm in bringing about many very useful economies. When President of the Society of British Gas Industries, he (Sir Robert) offered a prize with a view to stimulate interest in this important question, and quite a number of useful theses were submitted; the final result being a most valuable paper by Mr. F. W. Epworth, of the Richmond Gas Stove and Meter Company, on "The Utilization of Gaseous Fuel in Commercial Practice." Mr. Epworth obtained the prize. In regard to the question of the value of fuel, the exports of coal in January, 1919, and January, 1920, were respectively 2½ million tons and 3⅛ million tons, with values of £4,000,000 and £11,500,000—that was an average price per ton of 34s. 8d. and 68s. 9d. It was interesting to note that the total production of coal for the present year was estimated at 230,000,000 tons, of which it was calculated 49 millions would be for export and bunkers, and 181 millions for inland purposes. It was hoped that the miners would do their share in this reconstruction period, and settle down to really useful and hard work. With regard to the labour situation, there was just one crumb of comfort—viz., that in January, only 184,000 hours were lost by disputes begun during the month. In this respect the position that month was very satisfactory. Let them hope it would be kept up. The previous January (1919), 3 million hours were lost. He then called upon Mr. Thornton to read his paper.

GAS IN RELATION TO INCREASED OUTPUT AND NATIONAL ECONOMY.

Five years ago I read a paper before the Society detailing the very varied and important uses of coal gas for industrial purposes. This was followed in 1917 by a review of some of the valuable services rendered to the nation by coal gas during the strenuous days of the war. To-day I wish to continue the story, and show the application of gas to peace-time conditions, and particularly the contribution it has to offer to the difficult problem of production which confronts the manufacturer to-day. The use of gas for manifold industrial purposes was not a mere war-time improvization. Unlike some of the features of that stressful time, its value has not vanished with the return of peace, nor has its power diminished with the cessation of the demand for munitions of war. Rather, as the direct outcome of satisfactory experience in many realms of industry, and of confidence built on a foundation of good work rendered at a critical period, its prestige stands higher, its applications are more widely known, its possibilities are more appreciated by manufacturers, and the universality of its service is more generally realized.

In common with other of our important industrial utilities, coal gas for manufacturing processes may be said to have come into its own during the last five years or so. Not that gas was unused for industrial work before 1914, or its value unrecognized. But war conditions gave it an impetus that it might never have received in peace time; and more progress in its adaptation to manifold processes was made in five years than in the previous fifty. It is highly important that such agents as this, whose national contributions were of such magnitude and of such a notable standard of usefulness, should be harnessed to the work of reconstruction; that advantage should be taken of the increased knowledge gained of their abilities; and that their possibilities of future service should be exhaustively explored. Especially is this necessary at this time, when our national position demands that every individual shall give his best efforts, and that all machinery and all natural resources shall be developed and utilized to their utmost capacity for increasing production. This, indeed, is the text of the utterances of statesmen, employers, and of leaders of labour. With a unanimity which is as remarkable for its spontaneity as for its widespread character, the call is for production, increased production, intensive production. Our Chairman of this afternoon (Sir Robert Hadfield), when recently welcoming the Prime Minister to Sheffield, put the case very concisely and definitely when he said: "The world cannot get on its feet again until we recognize the principle of supply and more supplies." To all employers and to all employees the call comes alike. The responsibility belongs to both capital and labour; and the opportunities for meeting the national demands are available to both parties in industry. The manufacturer who deliberately keeps a machine idle, or neglects to instal the most efficient and modern machines, is as unpatriotic as the worker who "slacks."

The nation at present is not paying its way. Our expenditure is greater than our income; and a heavy load of debt is still accumulating. We must recognize that the war destroyed goods and material worth probably £50,000,000,000, and reduced man power (which is the power of production) by probably £10,000,000. Of these losses, both in material and men, Britain willingly gave her full share.

To the aim of improving our national position, the best thought and energy of us all must be directed. We must have more output—more coal, more bricks, more cloth, more ships, more engines, more foodstuffs, more everything! It is only in this way that the brighter England can be realized, that prices can fall, that taxation can decrease, that industrial conditions can become stable, and that we can all reap the great harvest that awaits us. The whole world clamours for the products of our factories. We have the supreme opportunity of our history. The next few years holds promise of being the greatest in British trade. Everything is contingent upon, first, exercising a reasonable economy, and, secondly (and perhaps paramountly) producing more. He who makes "two blades of grass grow where only one grew before" was never worthier of the thanks of the community than now.

I think there will be agreement with the general survey of the position which I have so far made; and so we may turn from the general to the particular.

What Gas Has Done and Can Do.

Let us look directly to the contribution which coal gas offers to the manufacturer and to his employees in their joint efforts to solve the great national problem of increased production. Many agents will need to be called in to assist; but none has a greater willingness nor a greater ability to serve than the commodity we are considering this afternoon. It touches the life of the community at every point; its ramifications extend directly or indirectly into every field of industry. I want to consider its services to the manufacturer and his employees, and to the nation in its task of economy, and the upbuilding of a stable economic position.

In the time available it is clearly not possible to deal with all branches of industry. The complete story, though full of interest, would be far too long for a single paper. I shall therefore largely confine myself, as in my last paper, to the subject of the heat treatment of metals, as an example of the aid which gas contributes in all manufacturing processes. The output of machinery of all kinds and types is urgently needed to-day, as it is by its help that we can compensate in considerable degree for the loss of labour in the war, the reduction of hours per week, and the natural inclination of workmen to desire less strenuous occupation. The heat treatment of metals is, therefore, of primary importance in assisting the output of machines, tools, and labour-saving and cost-economizing devices. All the industries of the

country, great and small alike—cotton, wool, cloth, leather, glass—could, did time permit, be similarly passed in review, and the results of increased production by the use of gas, which I shall show in the case of the metal industry, equally apply to any and all of them. Heat is a universal necessity in manufacture; and coal gas is the most adaptable and efficient means of providing this heat, and it enables the fullest possible value to be obtained from the coal used.

Dealing, then, with the question of how gas can help production in the heat treatment of metals, I will, for convenience, divide my remarks under four heads:

1. The eliminating of waste;
2. The cheapening of production;
3. The "speeding-up" of output;
4. The human element, improvement in working conditions.

All of these, in their respective spheres, mean increased production.

1. The Eliminating of Waste.

This is a very vital component of the effort to improve output. Waste means loss. Modern methods are being adopted with the object of eliminating waste—the day of the monumental "scrap-heap" is passing. Scientific organization has shown the way to the avoidance of "rejects" and "faults;" and to the utilization of "waste" material. As an example of the latest methods in the elimination of waste, we cannot do better than look at a heat-treatment shop of one of the leading firms of machine-tool makers. It is especially fitting that we should take this as our first illustration in view of the supreme place (as already mentioned) that machinery must take in all efforts to improve production. It is partly to a larger use of modern machinery that we must look for enhanced results. Upon the quality and quantity of its production all other industries are dependent. It is, therefore, satisfactory to reflect on the large number of makers of the highest grade of machine tools who rely on gas for the careful heating necessary for their production. Parts for machine tools require a high standard of mechanical accuracy; and obsolete methods of heat treatment are an obstacle to the attainment of this. It will be noticed at once that all furnaces are fired with coal gas, the reasons for which will be apparent when we consider the intricate process of the heat treatment which is necessary for gears. These are first annealed at 750° C., for six to eight hours, and slowly cooled. They are then, after other processes have been carried out, carburized at 900° C., given four hours' soaking, and allowed to cool-down. Each gear is then re-heated—first at 850° C., and quenched in oil; and again at 750° C., and quenched in oil. This method is found to reduce to practically *nil* the number of rejects for distortion—such large gears as 14-in., and even 18-in. diameter spur-wheels being successfully treated.

Another important part of a machine tool—viz., the spindle—calls for very exact and scientific heat treatment. It is carburized at 900° C. for six hours, and cooled-out. After further machining, the spindles are reheated in the furnaces at 850° C., and quenched in water; and again reheated at 750° C., and quenched in water. Many other parts used in modern machine-tool production are also heat-treated in the furnaces—such as ball and twist races, indexing parts of turrets, springs, plungers, worms and worm-wheels, all types of speed-changing gear and clutches, &c.

You will, I am sure, have been impressed by the importance of the heat-treating operations, by the stress laid on the attaining and maintaining of exact temperatures previously defined as needful for the perfect product. And the same applies to every trade or industry where the heat treatment of metals is necessary. It can readily be seen that it is the easy and perfect control that gas affords that enables such an exacting standard to be met continuously, and such excellent results to be obtained, day in day out, with a minimum of waste.

As another illustration of the help to increase production by the avoidance of losses, I would refer you to the motor industry. In this class of work, as will be readily understood, such vague terms as "dull-red heat" or "forging heat" are not admissible—meaning, as they do, anything within a range of 40° to 50° C. Operations have to be carried out at a definite temperature; and the limits allowed are within a very few degrees. If these narrow limits are exceeded by an infinitesimal amount, the component part must be scrapped. It is thus of vital importance to output to see that variations of temperature do not occur.

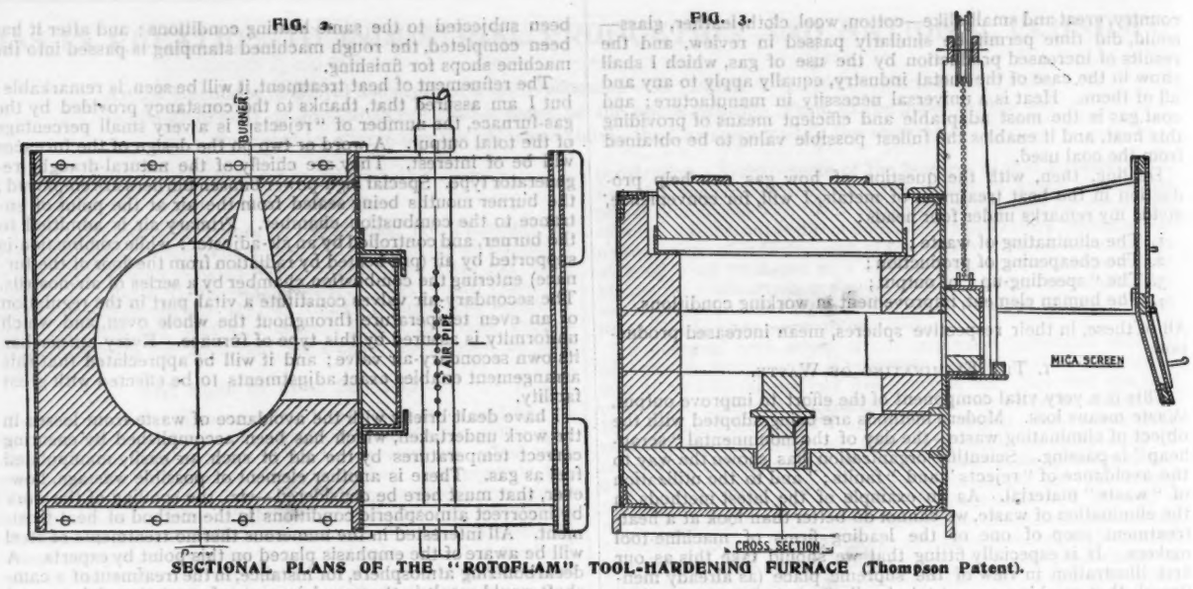
For this reason I think it will be of interest to you to note briefly the steps in heat treatment. Normalizing is the first operation. The part is heated to 780° C., and quenched in oil. It is then heated to 830° C., and again quenched in oil. The final heating is at 560° C.; and thereafter the shaft is quenched in water. The stamping is made sufficiently long to allow test-pieces to be cut from both ends. A test-piece is turned from one end. This piece is cut into two, and one portion is tested for tensile strength, and the other is subjected to an impact test. The test-piece from the other end is tested for fracture. In addition to these tests, a "Brinell" reading is taken on each end of the shaft proper. This treatment is designed to guarantee that all parts of the shaft have been subjected to the same heating conditions; and after it has been completed, the rough machined stamping is passed into the machine shops for finishing.

The refinement of heat treatment, it will be seen, is remarkable; but I am assured that, thanks to the constancy provided by the gas-furnace, the number of "rejects" is a very small percentage of the total output. A word or two on the design of the furnaces will be of interest. They are chiefly of the natural-draught regenerator type. Special high-power bunsen burners are employed; the burner mouths being sealed from the air at the point of entrance to the combustion chamber. Primary air is admitted to the burner, and controlled by an air-adjuster; while combustion is supported by air (pre-heated by radiation from the floor of the furnace) entering the combustion chamber by a series of air-nostrils. The secondary-air valves constitute a vital part in the regulation of an even temperature throughout the whole oven, and which uniformity is assured by this type of furnace. Every burner has its own secondary-air valve; and it will be appreciated that this arrangement enables exact adjustments to be effected with great facility.

I have dealt briefly with the avoidance of waste from losses in the work undertaken, which has been accomplished by ensuring correct temperatures by the aid of such an easily manipulated fuel as gas. There is another element of possible wastage, however, that must here be considered—viz., the spoiling of the work by incorrect atmospheric conditions in the method of heat treatment. All interested in the numerous thermo-treatments of steel will be aware of the emphasis placed on this point by experts. A decarbonizing atmosphere, for instance, in the treatment of a cam-shaft would result in the complete waste of much time, labour, and highly expensive material. Similarly, a reducing atmosphere at the wrong time is fatal to the accurate results required. In this connection I do not know of any fuel which can give more satisfactory results than gas. Undoubtedly, one of the main recommendations for gas for Sheffield steel-works, and indeed for all treatment of metals, is the ease and certainty with which the conditions desired can be realized—not by guess work or exhaustive trial, but by simple adjustment of the furnace, and this obtained day after day, exactly the same, without variation. One furnace annealing high-speed steel in Sheffield (in which city, I may mention, over 2000 gas-furnaces are in use) has up to now annealed 311 charges, of about 7 tons per charge; the aggregate weight, therefore, being approximately 2200 tons. During the whole of this work, which was carried out at a temperature of 1000° C., the only attention required by the furnace was the cleaning of the flues and the replacing of a few guard-tiles, which were very small matters. The type of furnace is the "L.P.G.A." [low-pressure gas and air], and with this design any required metallurgical conditions can be secured with a minimum of adjustment.

Still proving the point of the elimination of waste, I take as another example the hardening of high-speed steel cutters, tools, &c. This is a highly skilled operation, and one in which expensive losses can easily occur—the cost of the articles treated often running into many pounds each. You will be interested in quite a new and improved type of furnace known as the "Rotoflam" (Thompson's patent). The furnace chamber is circular, and is heated by gas and air-blast burners, two of which are used—one at the top and one at the bottom of the chamber, and equidistant on the circumference. The flame from the burners encircles the inside walls of the chamber, and generates a heat suitable for any class of high-speed steel. The point I particularly wish to emphasize is that there is no direct flame-contact—all the heating being by radiation. Therefore there is no excessive heat at one point; and a gradual soaking heat is ensured. The most delicate articles may be treated within the finest limits of temperature,

FIG. 1.—HEAT TREATMENT SHOP OF A WORLD-FAMOUS MOTOR WORKS.



SECTIONAL PLANS OF THE "ROTOFLAM" TOOL-HARDENING FURNACE (Thompson Patent).

without fear of burning. There is no flue or chimney in this furnace; the exhaust gases being expelled automatically through the mouth—thus preventing any free air from the outside from entering the chamber and oxidizing the steel. It will be realized how completely this well-designed furnace eliminates the possibility of spoilt work.

A fine installation of a somewhat different type of high-speed steel furnace is the Brayshaw, which is very well known and largely used in the steel industry, and produces remarkably good and consistent results. The upper chamber is heated by waste heat from the lower, and serves for preheating tools, &c., before they are put into the lower furnace, raising them gradually to a medium temperature preparatory to the final quick-heating required to bring them up to the high temperature necessary for hardening. By means of this furnace the skilled operator is enabled to ensure the production of good tools giving the maximum of service, and to avoid the waste of expensive material and time due to under-hardening or over-heating in hardening, &c.

I think I have demonstrated how gas can help in eliminating waste in processes of manufacture in vital industries, and by this positive reduction of waste materially assist in increasing production. I will now turn to an equally important subject.

2. The Cheapening of Production.

To lower the cost of his finished product must be the constant study of every manufacturer, as we realize that high prices mean less purchasing power, and less volume of output. Gas places us all under a debt for the service it renders in cheapening production. The economy that issues from the use of gas may be detailed under four heads.

A. *Capital Outlay.*—Where gas is employed, the building of a smoke-stack is not required. Gas-furnaces do not involve any structural alterations to the factory, nor special foundations; while their initial cost is in many cases lower than that of solid-fuel furnaces. The fuel has only to be paid for as it is used; and there is no big stock of fuel to be stored, with consequent interest on the capital outlay.

B. *Labour.*—To-day labour has (so to speak) a capital cost exceeding anything that has obtained in the past; and this fact must also alter our point of view when considering reduction of costs in relation to increased production. With gas, no stoking or clinkering or removal of ashes is required; and labour—highly-paid labour to-day—is thus saved. No labour or cartage has to be expended in transporting fuel—a further considerable saving. The choice for the position of the gas-furnace is practically unlimited. It can be brought into proximity to the machine worker, and thus intermediate handling is saved.

C. *Cost of Fuel.*—The use of gas renders unnecessary storage accommodation for fuel. Coal and coke stocks require valuable space, and incur rent without directly earning anything for the area occupied. In the running cost of fuel I have two examples to touch upon briefly—both from a large engineering centre in the North—comparing first the cost of gas with oil, then with coke. The first processes are the heating of spring buckles prior to pressing on to the spring, and the heating of round longitudinal stay-rod ends for locomotive boilers before "heading." The cost

FIG. 4.—A TYPICAL HEAT-TREATMENT SHOP EQUIPPED THROUGHOUT WITH "RICHMOND" GAS-FURNACES.

FIG. 5.—LOW-PRESSURE GAS AND AIR FURNACE (Richmond's Patent) FOR CARBURIZING TWELVE-CWT. LOADS AT ONE CHARGE.

of gas consumption in the furnace used for this work is 1s. 3d. per hour, as against 3s. 1½d. per hour with the oil-furnace it displaced; and as prices were on the rise the comparative difference is actually greater than these figures represent.

This same industrial area specializes in the manufacture of colliery tipping-tubs; one of the requisites for this work being the regular provision of ½-in. rivets. Gas is proved to be ideal for this process, giving a constant supply, unvarying hour by hour in quantity and quality, and keeping pace with the demands of the riveters. Gas performs the work, too, at a minimum of cost for fuel; the figure being only 2s. 9½d. per eight-hour day, against 5s. 7d. per day for coke for the same output. These are tangible differences which need no comment.

It will be opportune here to refer to the price of gas. I have prepared a chart, which shows that the price of this commodity has increased since July, 1914, by a very much lower percentage than raw materials, &c. The price of gas has made a contribution to the increased costs of manufacture to a very much smaller extent than all other commodities, and is to-day comparatively the cheapest of the factors that make-up the cost of the finished product. The percentage increase in the price of gas—viz., 80 p.ct.—is based on pre-war prices compared with the prices on Dec. 31 last of all gas undertakings in the United Kingdom making over 300 million cubic feet per annum.

D. *Factory Floor Space.*—Lastly, the gas furnace, self-contained and compact as before mentioned, economizes that very valuable asset—factory floor space. This provides the means for an increase in output per unit of factory area, without any corresponding increase in overhead charges—indeed, obviously without any increase at all in rent, rates, &c. This economy is illustrated by the fact that three gas furnaces can be erected in the same space as one of the coal-fire variety, with its indispensable coal-storage space, which, as previously remarked, is not called for with gas. As each of the gas-furnaces has precisely the same oven dimensions as the coal-fired one, this at once increases the output threefold for the same floor space.

From these facts it will be apparent to what a large extent gas can claim to reduce the cost of the finished article. There is a saving in capital outlay, in labour, in fuel, and in factory space, all of which react on the cost, and consequently on the selling price and the output.

3. THE "SPEEDING-UP."

Having now dealt, first, with the manner in which waste and rejects are eliminated, and secondly and more briefly with the reduction in the cost of production, I wish now to show how the actual output of the product is "speeded-up" by the aid of gas.

It will be apparent that the sections into which I have divided this paper necessarily slightly overlap, and that some of the points I have already dealt with in Sections 1 and 2 have their direct effect on output. I do not think I can better illustrate my point of "Speeding-up" output than by giving some general particulars and examples which have come under my personal notice.

In one instance coal-furnaces for annealing purposes were superseded by a battery of gas-furnaces. The results of this change were really extraordinary. It was found that the gas-fired oven (of the same size as the coal furnace) could take a load 33⅓ times greater than the coal-fired, owing to its construction and uniformity of temperature. In the deposed furnaces, owing to the "cold mouth," the load could not be placed within 18 in. of the door. Further, in the case of gas, the time the articles were in the furnace was reduced by 33⅓ p.ct. This, as will be seen at once, doubled the output per furnace, or, conversely, halved the time per unit of output.

To take another example of an annealing process, a case in which fairly bulky articles had to be heated, in large numbers, at a fixed temperature, with a limit allowance of a very few degrees up or down. To execute the desired quantities, it was necessary to fill the furnace completely at each charge. The articles were stacked on racks or trays, and the furnaces filled from the end to the mouth, so that the door could just be closed. Upon the completion of the heating period, every one was perfectly annealed; and tests made on those taken from the sides, middle, or ends showed no variation, and all equally passed the stringent conditions enforced. Had there been any variation in the temperature over the oven, those unequally heated would have been rejected, had to pass back for re-treatment, lowered the output, and thrown out of gear all the fine organization of the works that was based on the speedy and continuous passing of the article from one class of operation to the next.

This leads me to another point—viz., that, by the constancy of action of the gas-furnace, the time required for the heating operation is definitely ascertained, the work comes through at a uniform speed, and the works manager can safely organize his other departments without any uncertainty as to his supply of heat-treated materials. Consider an annealing process that is timed to take thirty minutes for actual heating. Allow five minutes for charging and five minutes for unloading, and the works manager knows that every forty minutes each furnace will give a definite output—not perhaps, not sometimes, not dependent on the human element, not varied by any external circumstances, but always and all day. This is a striking example of the service which gas renders. A sheet taken from a recording pyrometer will indicate at a glance the regularity with which the desired temperatures are obtained for successive charges in a gas-furnace, emphasizing the illustration I have just given.

I give later on some very convincing figures of the working of a "L.P.G.A." [low-pressure gas and air] Furnace—Richmond's patent; and it will not be out of place to describe shortly its principle of working. It is "over-fired"—*i.e.*, the gas supply at normal town's pressure is led through ports at one or both sides, where it comes into contact with the air (supplied at approximately 2-in. water-gauge) obtained from a small fan, which air has been previously well pre-heated by being taken through the opposite side of the furnace in fire-clay tubes, and then passed along the bottom of the furnace in close proximity to the hot waste products. Combustion takes place inside the working chamber round the furnace walls; the usual separate combustion chamber being absent. The flames produced keep well up, and sweep round the arch. The products of combustion then pass to the opposite side of the furnace, are carried under the floor, and up the other side away to the flue. All the waste heat possible is utilized in pre-heating the air, which promotes economy as well as efficiency.

The flues are required simply to convey away the products of combustion, not to create a draught: and adjustable dampers are provided, so that there is no actual pull from the furnace chamber to the outside air. With pressure inside the furnace, air cannot

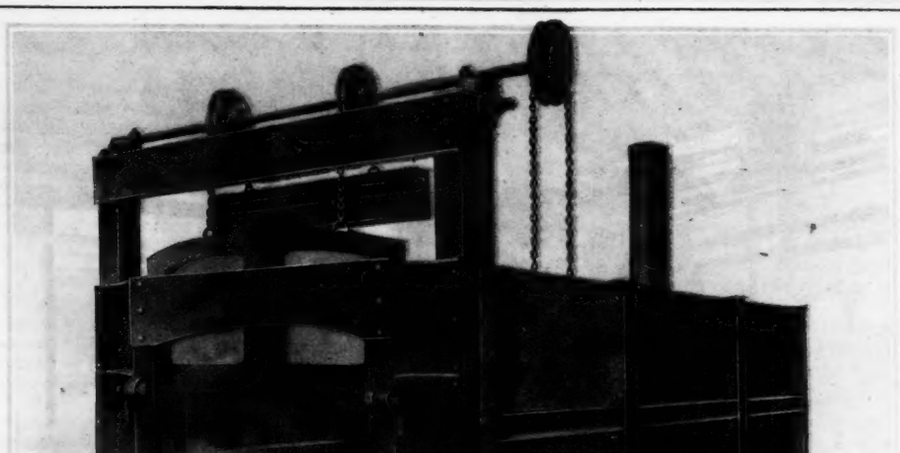


FIG. 6.—THE "REVERGEN" OVEN FURNACE (Davis's Patent).

enter through the door or other orifices, even when the former is opened for any purpose.

To come now to the actual performance of this furnace, I have been furnished with figures, which are strictly comparative, showing its superiority over a certain installation of solid-fuel fired furnaces in an important engineering industry. The operation is the normalizing of a certain small article which is hammered-out of mild steel wire. Owing to the necessity for absolute accuracy and dead even heating the solid-fuel furnaces were condemned, and replaced by others fired by gas, with the result that not only was the heating process rendered absolutely satisfactory, but the output was increased to an astonishing extent. There were for-

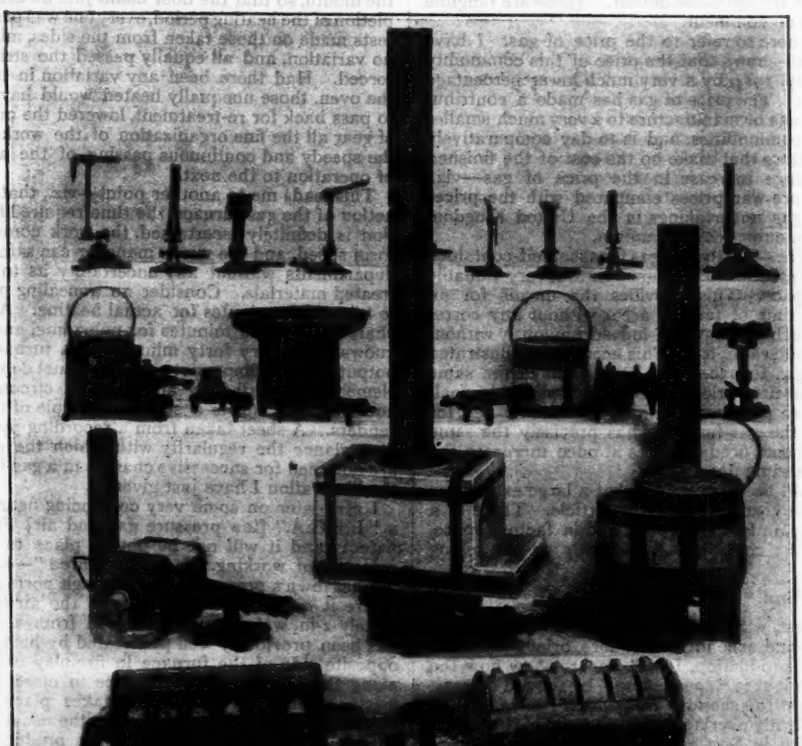


FIG. 7.—COMPLETE RANGE OF GAS-HEATED LABORATORY EQUIPMENT (Fletcher, Russell, & Co., Ltd.).

merly four solid fuel furnaces, measuring 6 ft. 9 in. long by 3 ft. wide by 1 ft. 9 in. high; and at each charge 6000 articles could be treated—two charges per day being secured, or a total output of 12,000 articles. The four "L.P.G.A." furnaces (of precisely the same internal dimensions) which were substituted for the coke furnaces took a charge of 10,000 articles, instead of 6000; and four charges per day were secured against two—thus making a total output for the day of 40,000 articles, as against 12,000 with the coke-furnaces, or an increase of 233 p.ct.

Further, this increase was obtained with actually a proportionately reduced cost for fuel; the gas consumption per charge costing 12s. 10½d. (with gas at 3s. 7d. per 1000 c.ft., which is a fairly high rate for industrial purposes), as against 13s. 1½d. per charge per furnace with coke. As the gas-furnace took a charge 66 p.ct. greater, the actual cost for fuel was 70 p.ct. more with coke.

The users of the gas-fired appliance for carbonizing have provided me from their experience with two very strong points in its favour, in addition to the increased output—viz., that the life of the carburizing pots which are used in this process, whatever fuel may be used, has been increased by 50 p.ct. by the use of gas, and that the cost of furnace repairs and replacements has been enormously cut-down—in fact, a furnace has been running daily for nine months (the capacity for continuous work is a most important matter in works' production), and has not yet cost a penny in any way for maintenance.

As another example of the speeding-up of output procured by the use of gas, I am able to give very complete results of actual working practice with a Davis's patent "Revergen" furnace, as compared with the coal-fired furnace which it supplanted. The principle of the "Revergen" furnace may be briefly stated to consist of a system of gas-firing by means of which heat losses, by way of furnace flue or flues, are reduced to an insignificant minimum; and the thermal energy thus recovered is utilized almost exclusively for the practical purposes of the furnace. The particular furnace in question was used for heating heavy forgings at a marine-engine works; and I may state that the figures both for gas and coal were provided by the users, the tests being made by them under ordinary working conditions.

COAL V. GAS FOR FORGING.

One Week's Work with Coal.

Forgings produced, net = 65 cwt.

Costs:	
9 tons of coal, at 39s. per ton	£17 11 0
Firing, 18 hours at 1s. 1d.	0 19 6
Carrying coal, 24 hours at 1s. 6d.	1 16 0
	£20 6 6
Cost per ton, net	£6 5s. 1d.
Coal " "	55·38 cwt.

Weekly Cost with Gas.

(Average of Five Weeks' Working.)

Forgings produced, net = 72 cwt.

Costs:	
50,250 c.ft. of gas, at 3s. 9d. per 1000 c.ft.	£9 8 6
One man, seven hours at 1s. 6d.	0 10 6
	£9 19 0
Cost per ton, net	£3 0s. 6d.
Gas " "	15,055 c.ft.

Output increased by 10·76 p.ct.
Cost per ton of forgings reduced by 51·6 p.ct.
Percentage of virgin coal saved, 80 p.ct.

It will be seen the net output was over 10 p.ct. higher, while the net cost of fuel and labour was reduced by over 51 p.ct.

Incidentally, these figures provide a very interesting illustration of another point—viz., the conservation of coal effected by the use of gas. It will be observed that in the coal-furnace 55 cwt. of coal were completely destroyed per ton of forgings. In the gas-furnace 15,055 c.ft. of gas were used per ton of forgings. Now, assuming the gas-works produces and sells 12,500 c.ft. of gas per ton of coal carbonized—many are, I ought to say, doing much better than this where there has been the opportunity of adopting the more modern gas-making process—each ton of forgings entails the carbonization of only 1 ton 4 cwt. of coal, as against the 2 tons 15 cwt. directly used and completely destroyed by the coal-furnace—thus directly saving 1 ton 11 cwt. of virgin coal, *plus* 12 cwt. of coke rendered available for sale, or a total saving of 43 cwt. out of 55 cwt.

Further, after the gas-works has carbonized the coal, there are the valuable secondary bye-products still left available for use—namely, tar, sulphate of ammonia, and a variety of valuable derivates from both gas and tar. This demonstrates in a very forceable manner the national importance of an extended use of gas, a subject to which I shall refer later on. Another example of an industry which has recently found the advantage of gas for increased output is that of the annealing of grey-iron castings; and the following examples will be of great interest to those engaged in this work. The process consists of packing these castings into iron pots, surrounded by a suitable inert material, such as sand, bringing to a temperature of 820° C., and maintaining it throughout for a period of three hours. The total gross weight of eight charges was 11,753 lbs. The gas consumption per pound of gross load was 1·89 c.ft. and 3·9 c.ft. per pound of castings. These figures are surely very convincing testimony to the use of gas for this work.

I should perhaps have referred earlier in the paper to gas-heated laboratory appliances in view of the extent to which the efficiency, the economy, and consequently the output of modern factories depend upon laboratory work and the researches of the works' chemist. Gas for experiments and investigation is, of course, not a new development. But appliances have been perfected, and fresh ones introduced; and a comprehensive series suggests the wide use of our commodity for this highly important work.

My next example of increased output as a result of gas installation deals with metal-melting. No furnace has made as a commercial proposition greater progress during the last few years than the gas-fired crucible furnace. It is now not only possible to use gas efficiently for this purpose in that it bears favourable comparison with solid fuel, but it shows many substantial advantages over its earlier rival. One of the most exhaustive comparative tests made of the capabilities of coke and gas for melting was by Mr. G. B. Brook at Sheffield University, who reported the result in a paper before the Institute of Metals in 1917. The gas-furnace used was of the standard pit type.

In order to make the test as drastic as possible, cupro-nickel (80:20) was chosen as the test alloy, in view of the high temperature required for this particular material. Every endeavour was made to ensure that the work should be on as large a scale as possible (thus closely following commercial practice), so that the

FIG. 8.—BATTERY OF TWELVE PIT-TYPE GAS-HEATED CRUCIBLE FURNACES.

results obtained would be accepted by manufacturers as a guide to what might be expected in their own melting-shops. During the ten working days covering the period of the test, the total weight of metal that went through the furnace was 51 cwt. The results proved conclusively that gas for melting metal is satisfactory from every point of view. The necessary high temperature of 1400° C. was readily obtained; and the average time of the 56-lb. load in the gas-furnace was 52 minutes, against 82 minutes with the coke-furnace. It was found possible on two of the days out of the ten to secure twelve heats with the gas-furnace in less than ten hours, as against the usual practice of five heats with the coke-furnace. The average life of the crucible was longer in the gas-furnace; and the lining of the furnace stood the test satisfactorily. The mechanical losses in charging and drawing were less than ½ p.ct.; the best practice with coke being 1 p.ct. The quality of the metal produced was everything that could be desired.

On the questions of labour charges and the cost of fuel, Mr. Brook's results are of great interest. He says: "On a large installation there would be a distinct advantage in favour of gas in the amount of labour required. Four coke-fired furnaces can be worked by three men. It would be possible to work a six-hole gas-fired battery with four men, even taking into account the extra mould preparation incident on the increased speed of gas-melting." In regard to consumption of fuel, the cost per ton of metal melted was 31s. 9d. and 36s. 4d. for gas and coke respectively.

FIG. 9.—BATTERY OF "LIP-AXIS" TILTING CRUCIBLE FURNACES (John Wright & Co.'s Patent).

The prices of gas have risen since this test, but so have the prices of coke.

These figures were strikingly confirmed at a meeting of the Institute of Metals in a paper read by Mr. W. J. Hocking on metal-melting as practised at the Royal Mint. He gave results of five years' working with both gas and solid fuel; and it was found that the gas furnaces gave an increased output, for gold, of 88 p.ct., up to, for cupro-nickel, 161 p.ct. The average cost of fuel and crucibles over five years was £3 1s. 2d. in the case of coke, and £2 7s. 5d. with gas, per ton of metal melted. The number of men employed was actually 19 p.ct. less with gas than with coke, for the same output. This convincingly shows the saving of time, labour, and material resulting in the larger output by gas.

Next let me deal with a fine row of pit-type furnaces, installed for the purpose of melting a special alloy. Founders who have had pit-type gas-furnaces, installed for the purpose of melting a special alloy, in use for three years say they are still "perfectly satisfied." Two tons of metal were melted per week, eleven melts being carried out per 8½-hour day, with a crucible life of thirty melts. The cost of renewals has been confined to replacing the top lids after the first ten months' use. This is convincing testimony to the commercial use of gas for melting. In this type of furnace the air for combustion is pre-heated as well as the metal, and this accounts to some extent for its high efficiency and large output.

When large quantities of metal are to be melted, the furnace usually employed is of the Lip-Axis-Tilting type (made by John Wright and Co.). These furnaces with crucibles up to 600 lbs. brass capacity, work with an incredibly low gas consumption.

An installation of furnaces of these big dimensions is an outstanding tribute to the progress made, and the stage of perfection reached, in the utilization of gas. As Sir Robert Hadfield remarked on the occasion of my last paper, it would have been deemed incredible a few years ago that gas could be economically used for such large industrial work.

Instances such as I have here given could be multiplied in all trades; but I think sufficient evidence even from the comparatively small number of examples dealt with has been adduced to prove the value of gas in relation to increased production and output.

4. The Human Element.

One other matter (and of considerable moment) remains to be mentioned—viz., the human element in the factory—the worker. Mr. Hoover, the American statesman, recently advised Europe to "work harder." One phrase in his statement was: "Many people in Europe are not at work." Now we are sure that Mr. Hoover did not forget, although he did not mention it, that the working power of Europe has been seriously reduced by the loss of many efficient producers, and those the most vigorous of our manhood. As Great Britain lost 800,000 killed in the war, it would be a reasonable figure to assume, allowing for the wounded and diseased whose physical strength has suffered considerably, that we are poorer by the loss of a million-and-a-half of workers. This is a very substantial reduction in our army of producers, and it is quite clear that, without other aids, and without greater organization, the same output as before cannot be expected. This fact must be recognized in all our comparative statistics of total production. It points emphatically to the need for the use of every appliance that can assist the human factor in industry.

Mechanical aids, scientific management, modern machinery, a higher standard of health and efficiency, greater skill and knowledge, more extensive training and practical research work, must all be called in to the help of the worker and for the improvement of the industrial output. I have already shown how gas can help in some of these things; and in concluding this section of my paper I want to present a few of the ways in which this servant of the nation assists in improving working conditions for the men and women in our factories. A better standard of living is called for—and rightly called for—and there is, in my view, considerable opportunity for ameliorating the conditions during the working hours, with far-reaching results. The strain will be less exacting, health will improve, efficiency will rise, production will grow, greater prosperity for all will follow as a natural sequence. I do not claim (I could not attempt to do so) that gas by itself can solve all these problems. But it has its contribution to offer; and it waits to join many other agents in taking a step forward in these matters. For example, take the furnace which is used for the heat treatment of high-speed steel. In its construction the comfort of the workman is considered in every possible particular. There is a pipe mounted in front and directly below the mouth of the furnace which is drilled with a series of holes, through which a stream of air, delivered under pressure, forces the exhaust gases upwards and away from the operator, and at the same time keeps cool the tongs or the shank of the tool for ease in handling. As an additional protection an asbestos-packed guard, with hinged mica screen, is provided. No heat is radiated on to the operator as in the case of a swing-out door. These are all small matters; but it needs very little imagination indeed to conceive how much they add to the ease of operation, save the worker from discomfort, and enable him to maintain a high rate of output throughout the whole of the day. In such an up-to-date heat-treatment shop the air of cleanliness and lightness is apparent; and the men themselves are ready to acknowledge the benefits derived from the gas-fired appliance.

The following is a sample of several similar reports that have reached me: "When gas was being installed, much opposition was shown by the men. They were conservative, as many workmen are, and were sure the furnace would not do the work. Now, after experience, I believe they would soon strike if it were ever suggested to go back to the old methods. They appreciate the greater efficiency, the cleanliness, and the labour-saving attributes of the gas-fired furnace."

Here is another (from a recent Technical Journal) describing a new installation of gas-furnaces: "The workmen say that the conditions of labour are much better than in the old days. The plant is easier to control, cleaner to work, and the necessity to draw-fires has been done away with."

Closely allied to, and indeed a natural corollary of the subject of improved workshop conditions and their effect on production, is that of general welfare work throughout the factory. I devoted a considerable portion of my paper in April, 1917, to this topic, and I will therefore only briefly touch upon it this time. It has, however, a direct and vital relation to the subject of increased

production under consideration. During the war "welfare work" received a remarkable impetus, and marked success attended its expansion. The form that this most frequently took—although in many factories this new principle in industry was developed to a very considerable extent—was the industrial canteen or works' dining-room. The results secured by, and the advantages accruing from, the establishment of these canteens have been very impressive. There has been a marked improvement in the health of the workers, with less sickness, and less absence and lost time; and

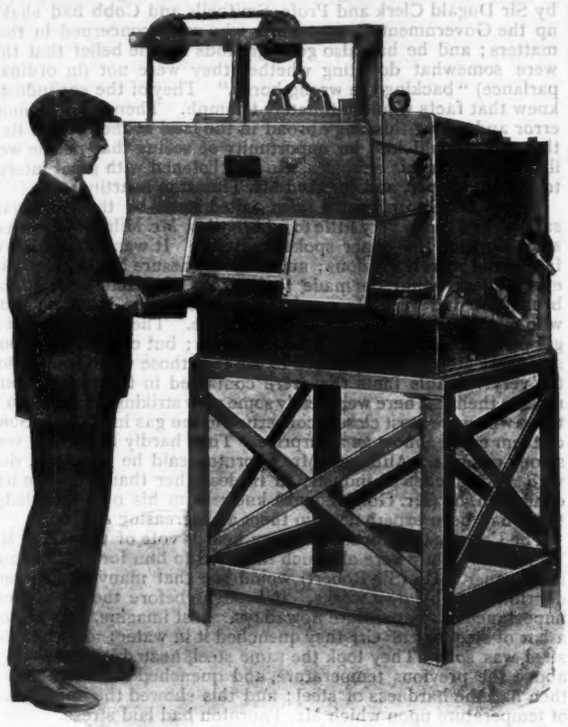


FIG. 10.—PATENT "ROTOFLAM" GAS AND AIR BLAST FURNACE FOR HARDENING EXPENSIVE HIGH-SPEED STEEL TOOLS.

a less tendency to alcoholism has been observed, all making for increased efficiency and larger output. Further, the substantial, nourishing, and reasonably priced meals provided by a canteen situated in the works have saved the time of the worker, given a salutary mid-day change from the workshop, enabled the shop to be properly ventilated in the complete absence of the workers, and generally created an atmosphere of greater contentment and goodwill. These are solid and substantial advantages, and their effects on output are testified to from all quarters. This is un-

FIG. 11.—COOKING EQUIPMENT IN THE KITCHEN OF THE BANK OF ENGLAND.

doubtedly a movement that possesses great possibilities for the future, and it is to be hoped that in all reconstruction proposals room will be found for this very helpful adjunct to factory life. It will be a great disappointment if the progress made in this direction is not maintained, and very greatly extended, under peace-time conditions.

Gas is, of course, the chief fuel used in these canteens. The reasons for the choice of this fuel are fairly well known and obvious; and so I will not discuss them again. I will, however, mention that it received official sanction and encouragement, for the Committee on the Health of Munition Workers reported: "Gas cooking is usually preferred on account of cleanliness, efficiency, and saving of labour." Quite recently the National Kitchens Division of the Ministry of Food testified to the suitability of gas for the cooking of food for large numbers in the following words:

> "The National Kitchens Division has had extended experience of cooking appliances, and still advises the use of steam, when available, for heavy duty such as boiling pans. The division's experience of electricity for cooking has been anything but favourable. Gas appliances are more constantly reliable, and much cheaper to instal and maintain, and they consume less fuel."

THE WORKER'S DOMESTIC LIFE.

We have now considered the worker during his labouring hours. But this section of my paper—the human element—would not be complete without a reference to the domestic side of his life—that is, to the home. The conditions there must directly and indirectly affect his health, efficiency, and ability to perform his daily work—a subject, however, to which I can only briefly refer now. The claims of gas for domestic purposes are so indisputable that its sway has become well-nigh universal. It is recognized that in the new housing schemes gas will play a leading part, as it provides the means whereby unnecessary labour is eliminated, economy is obtained, cleanliness and hygiene are assured, and the comfort of the worker, his wife, and his family is secured. Gas is an essential corollary to the raising of the standard of living, which we hope will ultimately lead to a more efficient worker, and consequently a higher output. Incidentally, gas can, and will, aid materially in expediting and cheapening the actual building of the new houses for which the nation anxiously waits. Gas-fires for rooms requiring intermittent heating, such as parlour and bedrooms, should be the accepted policy, and I am glad to learn this is recognized by the Ministry of Health. The use of the gas-fire abolishes chimney breasts and the large smoke-stacks necessary to carry off the products of combustion from coal-fires. By installing specially-designed gas-flues in place of the ordinary 9-in. by 9-in. coal-flue the cost is reduced considerably, as they eliminate brick chimney-breasts, brick footings, foundation concrete, skew-back arches, trimmers, chimney-stacks, and, at the same time, reduce the amount of leadwork required in soakers, flashings, aprons, &c. After most careful estimates, it has been found that the net saving is £30 per cottage, after allowing ample for the provision of gas-fires and gas supplies. On the 500,000 houses which were originally contemplated (the number is much greater now) the saving would amount to £15,000,000. Another important factor must be mentionod. By eliminating the chimney-breasts additional floor-space of about 120 ft. super is obtained and an increased cubical capacity of over 2000 c.ft. per block of four cottages.

ELIMINATING WASTE IN MANUFACTURING PROCESSES.

I have tried to show how gas eliminates waste in manufacturing processes, how it cheapens production, how it "speeds-up" output, and how it adds to the personal comfort and well-being, and thereby the efficiency, of the individual. There are, however, other considerations which should not be left out. The story does not end with the industrial benefit obtained by the use of gas, for it is the carbonization of coal at the gas-works that liberates the multitudinous and valuable bye-products. It is surprising how little the public generally realize the need of eliminating, as far as possible, the wasteful method of consuming coal in its raw state, which, apart from its inefficiency, involves the absolute loss of these bye-products. This subject is entirely appropriate to the present topic, as the nation, in these difficult days, cannot tolerate loss in any form. It is not, too, as though we were losing something of little or no productive value. Take, for instance, sulphate of ammonia. This excellent fertilizer is of the greatest worth to our agricultural community in the endeavour to produce more. There is an eager market for it abroad, and the national position demands that our export trade shall be swelled to its fullest limits. Then there is benzol, a highly efficient, home-produced motor spirit, that saves the import of petrol, and assists in solving the great transport question which is of much vital importance to the improvement of production. At present only about 14 p.ct. of our coal is carbonized, and benzol extracted. Again, decrease in the use of coal in its raw state, and increase in the quantity carbonized, would provide us with more heavy oil for generating power to drive our naval and merchant ships, and save importation. Then consider the dye industry, for the products of which we have been very largely, and all too long, dependent on other countries. The distillation of coal tar gives us the materials for the quantities of dyes we need. The "key" industry must be fostered. Then, of course, there is the gas coke, of great value as a cleanly, efficient, and smokeless fuel, suitable for domestic and many factory uses, especially steam-raising. It has lately been seen how large economies have been effected at the East Greenwich Electric Power Station of the London County Council by using coke and coal under boilers on the "Sandwich" system; and in the latest installation at the Manchester Corporation Electricity Works the same system has been adopted. Apart from direct money economy, a high evaporative duty is secured, by the intensity of the combustion of the fuel due to the porosity given to the bed by the use of coke.

In our striving after greater production and national economy, it is essential that the facts I have stated should take a foremost place. Our prosperity has been founded on an ample supply of cheap, readily available coal; but we have been too prodigal in its use. The most economical expenditure of our stock as yet unmined is a matter of vital national concern. If Great Britain ever has to begin to import coal, then, in the words of Lord Moulton, "the end of our industrial and commercial greatness will not be far distant." We must cease the waste of coal, and learn to use it wisely and well. Every smoking chimney, domestic or factory, spells waste of coal, and dissipation of those chemical bye-products the recovery of which would be of so inestimable a gain to the nation. In addition, every smoking chimney pouring forth its wasted energy pollutes the atmosphere, obstructs the sunshine, poisons our lungs, and lowers our physical fitness. Destruction is the antithesis of production, and any effort that can abate the smoke nuisance will be a direct contribution to our national effort to improve our economic position. This is not a matter of minor importance, or a side-issue; our large cities pay a heavy tribute year by year through the continuance of this evil. After the most exhaustive investigations, Manchester has come to the conclusion that the damage wrought by smoke, and the increased cost incurred owing to its unwelcome presence, is at least £1 per head per annum, or £750,000 for the city. The national case for the extended use of gas is overwhelming. The commodity under consideration has played a great part in the life of this country, and is destined to take a more prominent place. Gas manufacturing is one of our greatest industries; no industry has ever been developed which has been of more service to the community. Quoting from figures presented lately by Mr. D. Milne Watson, the Governor of the Gas Ltght and Coke Company, to the Board of Trade, the industry has 150 millions of capital invested in it; it employs some 100,000 workers; and there are 1600 gas undertakings. It uses 20 million tons of coal yearly, and some 50 million gallons of gas oil. There are over 8,000,000 consumers of gas, and nearly 3000 trades in which gas is used in varying ways. It has been one of the greatest contributors to the nation's health, comfort, efficiency, and well-being; and I am convinced that, in the search for means for providing the larger output of which the nation stands in such need to-day, we must look to gas as one of the chief agents.

The Future.

This being so, I wish, in conclusion, to say a few words which I hope will reach the eyes of many members of our Legislature. The Government has been cousidering the question of coal conservation, and of the provision of power. But it has been doing this from a single standpoint, and along a single line, with the result that special legislation has been passed for the electricity industry. Had the Government considered the matter exhaustively from all points of view, it would have been seen that if industrial economy is to be served to the utmost, the provision of power cannot be the monopoly of any one agent. They would also have seen that the efficient supply of a heating agent is as important in industrial economy and the conservation of coal, as the supply of a power agent. I am sorry to say, but it is the truth, that the Government has been in this matter inexcusably short-sighted, as I think my paper will have shown. Fortunately the Fuel Research Board has made a report upon which it is hoped legislation will be passed this session which will help the gas industry to render greater service to communities and industries. It is the duty of all members of this influential Society to urge on their members of Parliament that this should be done, and not only this, but that there should be revision of the statutory enactments relating to the capital of the same industry, so that capital may obtain a fair return for the service it renders, which it is not now obtaining—principally through the terms of the sliding scale of prices and dividends (which were determined on pre-war conditions) being out of harmony with what we must now accept as the newly established economic position. On the grounds alike of justice and progress, and to enable the industry to provide for the increasing demand for gas for manufacturing purposes, a modification of enactments is called-for; and I hope the call will not be made in vain.

At the close of the paper,

Mr. D. Milne Watson (called upon by the Chairman) said he did not anticipate being asked to make any remarks. He should like to say how much he had enjoyed the paper. Mr. Thornton had, he must say, put the case for gas, especially in connection with furnace work, in a very clear way; and his illustrations had been excellent. He only wished Mr. Thornton had not been speaking to a body of ladies and gentlemen who were practically all converts to gas. If he had had Sir Eric Geddes and other such people present, he was sure that the paper would have done a great deal to convince them that gas had to be reckoned with in their schemes for the future development of the country. The figures that Mr. Thornton gave with regard to the economy and the use of gas instead of solid fuel should be spread broadcast throughout the land. He did not think there were many people who fully realized the enormous economy that was to be effected by the use of gas for furnace work. He hoped publicity would be given to the figures. However much they of the gas industry might be versed in gas affairs, there was always a great deal to be learned from an expert like Mr. Thornton; and when one heard of these things, one realized what a great industry they had the honour to serve. It was very important that the information that had been so clearly put before them by Mr. Thornton should get into the hands—perhaps he ought to say the heads—of those who really knew nothing about the subject, and were obsessed with the idea that electricity was going to do everything, and that gas was almost out of date. Last year had cleared that up a little bit. People all over the country, especially those who counted in this matter, were beginning to realize that by the use of gas great economy of the national coal resources was going to be achieved. He had good reason for believing that the report by Sir Dugald Clerk and Profs. Smithells and Cobb had shaken up the Government Departments who were concerned in these matters; and he had also good grounds for the belief that they were somewhat doubting whether they were not (in ordinary parlance) "backing the wrong horse." They of the gas industry knew that facts would ultimately triumph. There was so much error and wrong-thinking abroad in the land at the present time, that they should lose no opportunity of seeing that people were illuminated on this subject. He had listened with great interest to the able paper, and thanked Mr. Thornton heartily for it.

Mr. F. W. Goodenough (also called upon by the Chairman) said he had really very little to add to what Mr. Milne Watson had said—in fact, the paper spoke for itself. It was packed full of facts—not merely opinions; and he could assure Mr. Watson that every effort would be made to see that the facts were spread broadcast, and were conveyed at any rate to the hands of those who ought to convey them to their minds. The difficulty was to get people to read what was sent to them; but certainly he could say every step would be taken to see that those who should know the very valuable facts that were contained in the paper should receive them. There were really some very striking figures even to those who were most closely concerned in the gas industry. Some of them came almost as a surprise. They hardly knew how very strong gas was. Although Mr. Thornton said he could not deal with all branches of industry in trades other than those he had dealt with, he (Mr. Goodenough) knew from his own knowledge there had been experienced in them an increasing output.

The Chairman proposed a very hearty vote of thanks to Mr. Thornton. They were all much indebted to him for his able and lucid paper. He (Sir Robert) would see that many copies were distributed in his own works. It brought before them the great importance of temperature nowadays. Just imagine, they heated a bar of steel to 728° C.; they quenched it in water; and then the steel was soft. They took the same steel, heated it only 2° or 3° above the previous temperature, and quenched in water. They then had the hardness of steel; and this showed the importance of temperature upon which Mr. Thornton had laid stress.

The proposition was carried with applause.

Mr. Thornton said he was extremely obliged for the hearty vote of thanks that had been passed. The greatest reward he had was to feel that whatever care he had taken in getting the paper together had met with the approval of those present. He hoped it would reach a larger audience when printed; and if it caused gas to be used in larger quantity for all purposes of production—so increasing the national good fortune—he should be amply repaid for any trouble he had taken. He thanked them very much.

Gas-Fired Core-Ovens.

The Editor of the "Gas Record," of Chicago, in publishing an article by Mr. Horace H. Clark on "Big Core-Ovens Gas Fired," points out that most founders bake their cores at night, at a time when demands for gas are at the lowest point of the twenty-four hours. The author of the article is Industrial Engineer to the Public Service Company of Northern Illinois, who sell large quantities of gas to manufacturing plants near Chicago; and he argues that gas is the logical fuel for firing core-ovens, on account of its reliability, cleanliness, ease of control, and because it is the cheapest fuel when the net results are taken into consideration. It is a desirable class of business on account of the high load factors; and every gas company can get its share regardless of the price of gas. A gas-fired oven is lower in first cost, and occupies less floor-space than a furnace fired by either coke or oil. With gas fuel the heat is distributed evenly throughout the oven; and the oven conditions are not affected by the weather, while there is no danger of burning the cores or of underbaking them. As cores are not inflammable, the direct type of gas-burner is used; and the burners are placed on each side of the oven, about 6 in. to 1 ft. from the wall, approximately at floor-level. Experience has shown that the best results are obtained with flues in the top of the oven, spaced along the centre-line without direct connection to a stack. Hoods are fitted to collect the smoke; but they are constructed in such a way that no direct pull is made on the oven. On ovens of not over 250 c.ft. contents, the atmospheric type of burner should be used. On ovens between 250 and 500 c.ft. contents, either atmospheric or fan-blast burners should be employed, depending on the local conditions. Where cores of 50 lbs. or so are required to bake in less than two hours, blast-burners should be fitted, even on small ovens. On ovens of more than 500 c.ft. content, the blast-burner should be used. For purposes of burner design only, gas consumption can be estimated by figuring 1 c.ft. of gas to 1 c.ft. of contents. On very large ovens of 3000 to 4000 c.ft. content, the gas consumption can be taken as being half of the cubical contents; and various other sizes of ovens will come between ½ and 1 c.ft. of gas per c.ft. of oven contents.

GAS AND HOUSING SCHEMES.

By R. J. ROGERS, Fittings Superintendent to the Birmingham Corporation Gas Department.

[A Discussion at the Annual Meeting of the Midland Association of Gas Engineers and Managers, March 11.]

The housing problem is with us; and it is for us to consider, as gas engineers, how best we can embrace the possibilities open to us for increasing the sales of gas in our respective areas. Very few, if any, districts in the Midland area are without their housing schemes. In a large measure the extent to which gas will be installed will be in proportion to the amount of attention given to the matter by the gas undertaking, and the manner in which the architect, builder, and local housing authorities are dealt with. True, in many districts there is a cry for the "all-electric" house; but for the thousands of houses which are to be erected for the artisan class, gas should at present be able to hold its own in this class of property.

I have stated several times during the past few months, when speaking on the subject before various Gas Associations, that the present is the golden opportunity of the gas industry to instal gas pipes in all new houses, and to prove to the housing authorities the indisputable advantages of gas for heating, cooking, for providing hot-water, and for lighting the homes of the masses. We must all bear in mind the fact that if gas is not installed in the houses during their erection, it will be an infinitely greater difficulty to "get in" with gas appliances after the houses are built and occupied. You are all familiar with the objection of tenants to having disturbance of floor-boards, carpets, and furniture when they are living in the house.

Half the battle will be won if the gas-pipes are put in when the houses are being built. It is no use waiting for architects and builders to arrange the gas supply pipes in the houses. If you do, the old difficulties will be reproduced—viz., jerry gas-fitting and inadequate sized pipes, resulting in permanent dissatisfaction and complaints from consumers. The local gas manager must take steps, with tact and discretion, to advise builders of the sizes of pipes necessary, and the manner in which they should be laid. Large, medium, and small gas undertakings are affected equally in this matter. Whereas in a large undertaking a special section may be organized to deal with the matter, the gas engineer himself may, in the smaller undertaking, be obliged to approach the building authorities. No matter what the circumstances may be, no effort should be spared by gas undertakings to ensure that adequate provision for the use of gas is made in all new premises.

There are many aspects to consider in connection with this problem, not the least of which is the financial one. How far are gas undertakings justified in the free installation of services or gas supply pipes? This is a matter which must be decided by each individual concern. In view of the financial situation of most gas undertakings at the present time—brought about, not by any lack of ability or initiative on the part of the managers, but chiefly by the restrictions of a non-appreciative Government—I do not see why they should be expected to instal all internal gas supply pipes free of charge in the new houses. This is often expected of them by various parties, who state that, as the pipes are to be used to convey gas to appliances which will consume it, and for which the gas undertakings will make a profit, they should be laid at the expense of the gas authority.

In building the new houses, the owners should themselves provide the gas supply pipes. It may, however, in some cases, be polite for the gas undertakings to consider the question of laying the services, or even fixing the meters, free of all cost. It has been the practice for many years past for some gas undertakings to lay all gas services free of charge; while in others all service-pipes laid on private ground were chargeable to the landlord. No legislation exists in this country to control the sizes or methods of laying pipes in new houses. I never lose an opportunity of bringing this matter before gas engineers, as I am strongly of opinion that the industry should possess equal powers with other public utility undertakings—electricity, water, sewage, &c.—to ensure that gas supply pipes of adequate size are installed.

I have recently suggested that, in view of the number of complaints received by gas undertakings, and the inconvenience caused to the gas user by reason of small and badly-laid pipes, the National Gas Council should seriously consider this matter with a view to obtaining statutory powers for local authorities to ensure an improvement being effected in new houses.

It may interest you at this point to know just what we are doing in Birmingham in this matter. In the past it has been our usual practice to charge for all services laid on private ground; but in order to induce builders to fit-up houses in accordance with our specification, we have offered to lay service pipes free of charge to new houses up to a distance of 30 ft. on private land. I am pleased to say that the housing authorities in Birmingham are loyally co-operating with us to ensure that the gas supplies in all the houses erected under their supervision are fitted to the specification laid down by my Department.

The following is a copy of the letter which we forward to all builders with whom we get in contact.

HOUSING SCHEME.

With reference to the above, the Gas Department are anxious that all new houses now in course of erection shall be fitted with adequate gas supply pipes at the outset. The waste of time and damage to the property entailed by running supplies to gas-fires, &c., when the tenants are in occupation, is obvious.

The Department is prepared to lay up to 30 ft. of 1 in. service pipe free of charge to all new houses in which the gas supply pipes conform to a specification, the chief points of which are as follows:

(1) A ¾ in. iron gas supply pipe from the meter to the scullery. (For cooker and wash boiler.)
(2) All horizontal pipes under floors to be not less than ½ in. diameter.
(3) Half-inch branches to all fireplaces, with the exception of the living room.
(4) Bracket positions to be 6 ft. 3 in. from the floor level.
(5) Tees and plugs to be left at the bottom of all upright pipes.
(6) All positions to be left capped or plugged on completion of work, and all pipes to be tested.

We shall be pleased to co-operate with you if you will be good enough to send us plans. We would indicate thereon the runs and sizes of the pipes we consider necessary. We would also let you have a full specification.

If the builder decides to accept our offer, we forward him particulars of our requirements.

We have a new building section, in charge of a new building inspector, whose duty it is to keep all records relating to new building schemes, for keeping in touch with architects and builders, and advising them generally on the "lay-out" of the gas supply system. The inspector is assisted by a new building foreman, who is a thoroughly experienced gas-fitter, and whose chief duty is to see that the gas-fitting work in course of installation in the various properties is carried out to the specification laid down by the department.

At the National Trades Exhibition at Bingley Hall, Birmingham, we are arranging an exhibition stand, on which representative gas appliances will be shown, in addition to which we are giving a practical demonstration of the economy which may be effected in the building of gas-fire flues in the thickness of walls, by dispensing with the usual chimney breast, thereby saving bricks and labour in addition to giving greater space in the room. We shall also have an information bureau for architects and builders, where every assistance will be given on the subject of gas equipment for the home. I trust that any Midland gas engineer who desires an architect or builder from his area of supply to inspect this stand will arrange for a visit to be paid to the exhibition, which will remain open until May. The Model House of the British Commercial Gas Association will also be on view.

I cannot conclude without making an appeal to you to do everything in your power to ensure that the gas-fitters who carry out the work in the new houses are well-trained men and well-versed in the fixing and maintenance of modern gas-consuming appliances. Without them, we cannot expect to obtain the highest efficiency or to gain the satisfaction of the consumer, which in all our plans and considerations should be our primary object.

DISCUSSION.

The PRESIDENT (Mr. J. R. Duff, of Banbury) remarked that they were indebted to Mr. Rogers for having opened a discussion on a subject which was of interest to all of them.

Mr. J. FERGUSON BELL (Derby) said the question of the housing of the working classes was a live subject; and it was very necessary that gas undertakings should see that these houses were fitted up with gas appliances. It was unfortunate that in some cases the municipalities owned the electrical undertakings, and went to the expense of wiring and fitting-up these cottages for electric lighting only. They all knew how little a year the ordinary working man spent upon the lighting of his home—especially with Daylight Saving. It was not worth the outlay. They saw all over the country that these cottages of six-rooms were costing something like £1000. No wonder the cost was high, when such extravagance was perpetrated. The great bulk of the tenants who took these houses did not want electric light. It was important, anyway, where local authorities owned electricity undertakings, and the gas supply was in the hands of a company, that the company should see that at least there was a shilling slot-meter installed. His own practice was to put in a service and fix a prepayment meter; and then he asked the authorities to put in a cooking-stove and a gas-wash-copper. He would just like for a moment to touch upon the enormous increase in the cost of gas appliances. The price to-day of the gas cooking-stove which they used to buy in pre-war days at 32s., was £6 1s. 6d.—that was about four times as much. They found that the different gas-cooker makers were amalgamating, and forming one huge combine. He had nothing to say against combinations; but those connected with them were human like other people, and unless they were kept in check he was afraid prices would mount seriously high. Four times as much for a cooking-stove was more than they ought to be asked to pay; and while a combination ought to be of benefit to the consumer, so far he had failed to notice any reduction in cost due to this combination. He just threw this out as a word of warning to those in authority, because with present costs of fires, cookers, wash-boilers, &c., it was quite impossible to provide them for all prepayment consumers. Most of them were limited to a charge of 10d. per 1000 c.ft. above the ordinary rate for prepayment supplies. He was perhaps one of those who were instrumental in bringing about this figure, because in 1903, when Derby was in Parliament, he was asked what would be a fair charge for gas to be inclusive of rental of cooker and meter, and his answer was 10d. per 1000 c.ft., which at that time was a fair price, and allowed a reasonable profit. With four times the price being charged for apparatus, they had, however, already stopped hiring-out cooking-stoves or gas-fires. People who wanted them, now had to buy them. If companies spent capital, they had to pay interest on it; and he did not think ordinary consumers ought to be penalized by those who used the apparatus not

paying a fair price for it. Mr. Rogers asked how far gas undertakings were justified in going with these houses. He (Mr. Bell) thought at present they were not justified in doing anything more than fix a meter. If the authorities could afford to put in electric fittings, they could afford the very necessary gas-cooker. Coal people did not provide coal ranges and ovens; and he did not see why gas undertakings should be called upon to provide cookers, unless they were going to receive a reasonable profit on the outlay. Some allusion had been made to a standard specification for gas undertakings in respect to the piping of houses. He hoped Mr. Rogers would persevere, and that he would be the means of issuing later on a standard specification in accordance with which all houses would be piped. Very often the complaints they received with regard to the supply of gas were not in consequence of the quality, but the quantity. Consumers as a rule could not distinguish between quantity and quality. If they got sufficient gas, they would be satisfied in nine cases out of ten. It was interesting to learn that there was to be an exhibition at Bingley Hall, to which they would be permitted to send architects and representatives of local authorities to view the model house of the British Commercial Gas Association, &c. He felt himself they were greatly indebted to the Birmingham Corporation for their initiative, and also to Mr. Rogers for bringing this matter forward. They desired to bring gas to the front; and in doing so they would confer great benefit on the masses of the people, who required gas for lighting, cooking, and heating purposes. This constantly needed impressing upon housing authorities. The money spent on wiring for electricity ought to be spent on buying and installing gas appliances. In Derby, the Corporation had an electricity plant, and were going to wire the houses. He said, "Very well. You have the lighting, and I will have the cooking and heating; and we shall be very good friends." Every house would have a gas-copper and 5-light meter, and one-half would have gas cooking stoves. He ventured to say that it would not be very long before some of them had gas-fires. The Corporation were not going to charge so much per unit for electricity, but 1s. per week; and the tenants would be able to use as much electric light as they liked. This was not a very economical way of working. It was no wonder that rates were going up all over the country if such unbusinesslike methods were followed by electric light undertakings. He did not believe in pushing business unless it was going to be a paying proposition. Any expenditure they undertook must bring a reasonable return, so that they did not have to tax the gas consumers.

Mr. JAMES PATERSON (Cheltenham) said some of them had just been to London to a meeting of the General Committee of the British Commercial Gas Association; and they had had the advantage of taking part in a very interesting discussion arising out of a paper by Mr. T. P. Ridley, of Newcastle-on-Tyne, particularly on the financial aspect of the housing question. The information brought out and the data put forward at the meeting were more than anyone could carry in his head; but he could, for their guidance, give them just one or two points. One thing was the impossibility at the present time of gas undertakings going in for this huge financial outlay "on their own." The cost of providing appliances to hire in most cases, in proportion to the size of the scheme, was alone really prohibitive. It seemed that the only thing was to impress upon housing authorities that, if they wanted the houses to be fitted-up, they must do it themselves. The gas undertakings could provide the stuff; but the authorities must pay for it, and put it in. Under these conditions, the supply could be by either prepayment or ordinary meter. Among the figures mentioned at the meeting to which he had referred was the enormously increased amounts that would have to be put on the gas to meet the hiring of these appliances, if they were paid for through slot-meters. He thought the estimate arrived at by several speakers was that something like 2s. or 2s. 2d. per 1000 c.ft. would have to be added, instead of the 1od. they were all contented with a few years ago, to cover the extra cost of interest, maintenance, depreciation, &c., of the different appliances. The British Commercial Gas Association were in very close and constant touch with the Ministry of Health and the Director-General of Housing with regard to these schemes. They had concentrated on this matter, and were the best of their organizations to follow up in an expert manner questions of housing. Through the efforts of the B.C.G.A., there were a number of points on which the Director-General had agreed to meet the modest requirements of the gas industry. Among the things so asked for was the provision of a flue for the cooker, points for gas-fires, and so on. These matters had been threshed out, and generally agreement had been reached with the Director-General. But between gas undertakings and the Director-General were the gentlemen who had to scrutinize in the first instance the plans and specifications submitted by the Housing Committees of the various districts. These were the gentlemen who had to decide as to how far these schemes should be passed and recommended for acceptance, and so were the ones to convince of the desirability of extending the use of gas in the houses built under the different schemes. Members who might be able to get into close touch with them in some way or other would be well advised to do so. He did not know how far the B.C.G.A. were going to instruct members in this matter. There was one point about which he would like to ask the opinion of those present, which had not been referred to by Mr. Rogers. This was the question of the mains that would have to be laid for the housing schemes, which varied according to position. In Cheltenham, a scheme had been prepared on an estate which was adjacent to existing town mains, and there should not be much difficulty in laying mains where required. But very naturally his Company were not going to lay mains as fast as ever the roads were formed; and they had accordingly drawn-up a plan by which the work would be carried out gradually. As the estate was developed from the very commencement, they proposed to lay their main forward, and carry it on as the houses were erected. The roads, he presumed, on most of the housing sites were on a pretty liberal scale as regarded design and lay-out. They had in their case in the middle a 45 ft. road, and then a footway each side, 14 ft. 6 in. Beyond this on each side were low walls, and then a sort of front garden and entrance to the house. The total distance between the two house-fronts was about 120 ft.; and on considering the matter, he came to the conclusion that it would be good policy not to lay one main in a road of these dimensions but one on each side in the footpath. One would thus get away from the difficulty of road opening, though much of this was not to be anticipated on a new estate At the same time, the length of services was shortened. With them in Cheltenham this point was rather important, because their practice from time immemorial had been to lay lead service-pipes. He did not know how far this practice obtained in the Midlands; but there were many things in favour of it, in spite of the present price of lead. By laying mains on each side of the road, they would be able to at any rate put down the mains and services at no greater cost than one main in the road with the long service necessary on each side. With two mains there would be only about 24 ft. of service on each side, which was a consideration when dealing with lead pipe. He would like members to keep an eye on any announcements they might get from the B.C.G.A., because the work that body were doing was of the utmost importance, and would be of the greatest value. Shortly, he believed, there would be sent out some suggestions as to how to proceed which would be very useful.

Mr. C. H. WEBB (Stourbridge) remarked that the first thing he noticed in dealing with architects was their ignorance with regard to apparatus. Of course, he knew that they had to do everything they could to cut-down expenses; but there did seem to be a strong inclination for very cheap, poor quality apparatus. This had taken a good deal of combatting in their district; but they had got the thing on a proper footing now. A few pounds extra invested at first would be more than repaid in the longer life of the apparatus. Then they wanted the gas undertaking to do everything for nothing; and it was necessary to point out to them the expenditure. Not only had it been their practice in the past to give services and fix the meters free, but they were going to lay mains. There was, however, another difficulty in regard to the situation of the estate. Though it was quite easy to lay mains under a housing scheme, the situation of the site was very often on the edge of the district; and it became a question of a trunk main extension in addition to the main on the estate. This was their case: and so when the architects and people interested saw that the gas undertaking had to provide a trunk main extension, and then the lay-out of the estate, and that they would be giving the service pipe and the fixing of the meter free, they began to recognize that there was being done for them all that could be expected. They, therefore, agreed to deal with the internal piping and the providing of the apparatus themselves; and all that was required was to impress upon them the necessity of having first-rate apparatus of its kind. He had been wondering about the advisability of having one or two mains in a street. His own leaning somehow was towards one, having regard to the fact that the district was practically completed at once. Was it the practice in any locality to put more than one house on a service? It seemed to him that under certain conditions this might be rather economical. Mr. Rogers mentioned the need for well-trained fitters. They would all like them; but getting them was the greatest difficulty. Many went to the war, and had not so far come back. There was any amount of work to be done; but it was almost impossible to get it carried out.

Mr. R. S. RAMSDEN (Leamington) said that in connection with the scheme in his town he had submitted proposals for carcassing the houses, and supplying cooking-stoves, coppers, &c., and lighting fittings. At first he understood that this was being favourably considered; but later he was informed by the architects that it was the intention of the Housing Commissioner to cut-out all the lighting fittings, which were to be found by the tenants afterwards, the idea being to reduce the paper cost of each installation. At Leamington, they approached the contractor for a 130-house estate, and suggested that he should use a gas-engine while the work was in progress. It was not an original idea; but he was pleased to say that, by getting a main right through the estate at once, they secured an order to supply a gas-engine, which was going to be used for breaking bricks, mixing concrete, and grinding mortar. This would be very useful in helping to pay the cost of the work as it went on.

Mr. F. C. BRIGGS (Dudley), referring to putting in electricity for new housing schemes at the expense of gas, said he felt their great safeguard was education of the consumers and working people generally in their own districts. His Company also had stopped hiring-out apparatus, after having raised their hire charges to a point beyond which they could not reasonably go, and which simply covered the increased cost of maintenance. He rather favoured having mains on each side in the case of fairly wide roads. It was necessary to look many years ahead. He was being put to very heavy expense at Dudley in dealing with existing mains where reinforced concrete was concerned; and he could get no help. If these mains had been laid in the first place on each side of the road, the Company would have been put to none of this expense. His housing scheme was being put up on old pit ground. The houses in some cases would be considerably below the road, and in others above it. What should be done with the main in a district like this? He was taking the risk of putting it under the pavement, and with the low houses running the service down to the house, putting a T at the lowest point, and a length of service to act as a syphon, with a plug in an accessible position. In this new scheme, they were not going to put more than one house to a service unless the doors were side by side, in which case the two would be put on one service. They had managed to get gas-fires in the contractor's office, through having laid on the mains pretty early. Every house was having some lighting points, certain gas-fire points, and a gas-copper and gas-cooker. The gas-copper and gas-cooker and all the points were being paid for by the Corporation; and the cost they would thus bear would come to from £15 to £17 per house, including piping, service-pipe, connecting meter, and providing points.

Mr. HUBERT POOLEY (Leicester) said they were much indebted to Mr. Rogers and the Corporation of Birmingham for the kindness they always extended to the gas industry in the Midlands. He had seen some of Mr. Rogers's skeleton plans for the housing schemes, and they were excellent.

Mr. A. T. HARRIS (Market Harborough) thought, where houses were far apart, and the number of services was small in comparison with the length of main, that it was better to run a single main. It seemed to him it did not matter about taking two, three, or four houses off a service, provided the service was in the first instance large

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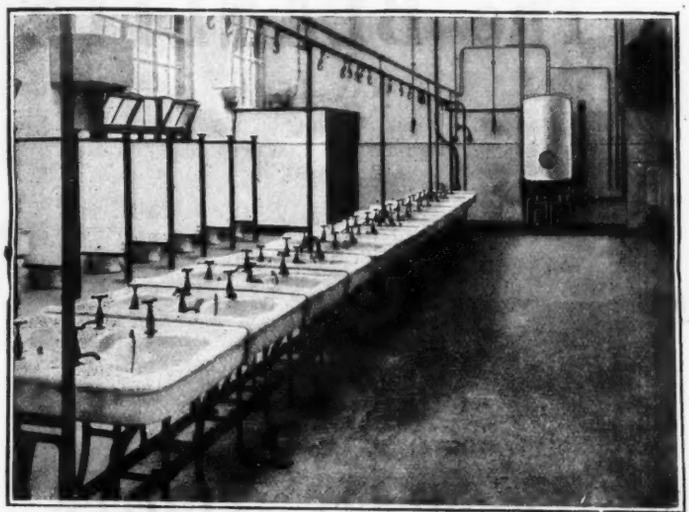

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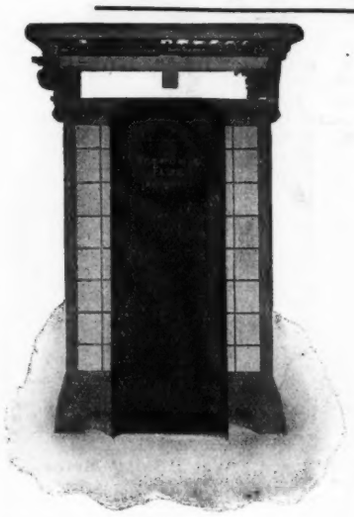

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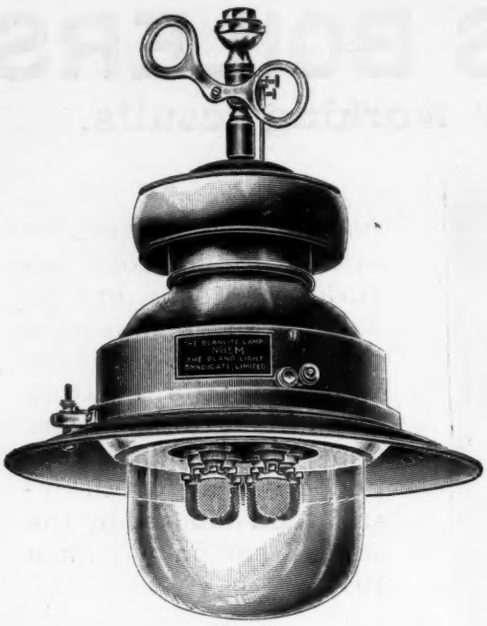

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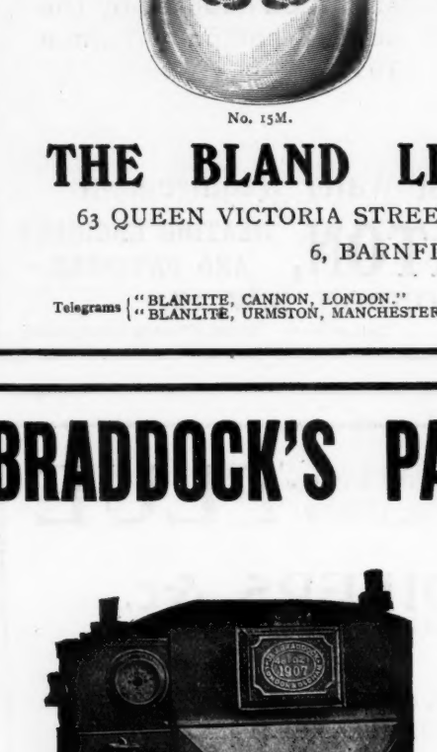

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enough. He was using 1¼ in. pipe for four houses, and in no instance was he putting in less than 1 in. pipe. He was using galvanized steel tubing. As the result of a long experience he thought they had in the past been too cheeseparing in regard to the quality of the materials they buried. He had not been able to get the authorities to pay for a cooking-stove nor to give anything towards the cost of mains; and so the gas undertaking were being put to a very large outlay for what he thought would be a very small return. So far as he could see, it would be anything but a paying proposition; but they had to do it.

Mr. F. ROBINSON (Swadlincote): Could you not make the Local Authority guarantee 20 p.ct. for two years, which is usual in laying a new main?

Mr. HARRIS said he was in the service of the Local Authority; and his instruction was to proceed. He had no guarantee whatever.

Mr. C. H. CARDER (Oldbury) said that, under the Act, anyone requiring them to lay new mains must guarantee 20 p.ct. for two years. He, however, was in a rather unusual position. It was proposed to develop a large estate, and the Surveyor wanted to get his roads down straight away.—they would be "Tarmac" roads—before any houses were built. In all recent developments, he had put the main under each footpath; and he thought it paid. But the Surveyor wanted to do this work before the mains could become remunerative; and it might be five years before the houses were finally built. He was wondering if anyone had made arrangements whereby a certain interest on the outlay could be secured until such time as mains became remunerative, or until the houses were erected. It was going to affect their finances considerably if they had to wait five years before getting any return for outlay on mains. He had, in common with Mr. Harris, used services for more than one house. In a scheme carried out in 1916, they had a number of houses built on the Garden City plan, set back nearly 100 ft. from the road, and leaving nearly 280 ft. between frontages; and they were in blocks of four. To these blocks they ran a 1¼-in. service, and then distributed ¾-in. services from it.

Mr. W. A. SAPEY (Tamworth) said his Company went to Parliament in 1911 for an extension of their powers; and a clause was put in their Act—he thought it was from the Model Bill—by which the Company were able to insist, by giving due notice, upon the piping of houses being carried out to their specification. There was a scheme for eighty or ninety houses in his town; and the Company were asked what they were going to do. He replied that the authorities would have to pay for services and for everything else.

Mr. C. M'PHERSON (Clay Cross) said that in connection with a housing scheme in his town, he was asked by the Clerk to put down mains; and he replied that he could not do so without the usual guarantee of 20 p.ct., which was refused by them for several months. However, he stuck to his guns, and declined to give them any gas; and after correspondence with headquarters, they had now decided to give the guarantee. This was one instance they had in the country of the authorities assenting to a guarantee for two years. They were putting ¾-in. pipes into the houses, and upstairs ½-in., and the gas undertaking had no power to compel the architect to increase the size. The first scheme included a cooker and copper, as arranged with the Government housing authorities; but they had now cut out the gas-cooker, and asked him to supply a 5-light shilling slot meter. He had declined to put in a cooker at present prices, unless the authorities were prepared to buy it, in which case he would fix it free.

Mr. ROGERS remarked that the subject with which he had dealt was one of great importance, which concerned the gas consumption of the future. There was sufficient material for the Association to have another discussion.

This it was agreed to do, on the suggestion of the PRESIDENT.

GAS AND COAL DUST EXPLOSIONS.

By T. F. E. RHEAD, M.Sc.

[Abstract of a Lecture delivered to the Midland Junior Gas Association, March 11.]

The lecturer described, with experiments and slides, the bearing of "ignition temperature," "higher and lower limits of inflammation," the mode of propagation of flame during the "uniform period," the "vibratory period," and the "detonation wave period" on gaseous inflammation and explosion.

Passing on to coal dust explosions, he pointed out that, broadly speaking, fine coal dust in air could be looked upon as a very coarse combustible gas. It had been shown during an exhaustive inquiry into the nature and prevention of coal mine explosions carried out on a large scale by the Mining Association of Great Britain and the Home Office (1907-14), that flame could be propagated through a coal-dust cloud in two ways—first as a moderately slow inflammation, during which predistillation of the dust occurred. If the cloud extended a sufficient distance, the inflammation gradually acquired greater intensity, due to the effect of eddies and compression waves caused by coming into contact with obstructions in its path, such as the rough sides of the gallery, pit props, &c., until the second mode of propagation set in—viz., explosive combustion—during which the inflammation travelled at tremendous speed, and the dust particles were consumed without predistillation.

Unless the dust cloud was produced by means of ignition, it was necessary to have 150 ft. of ready-formed cloud before the inflammation could acquire sufficient energy to raise the requisite amount of dust in its path to continue propagation. The composition and fineness of the dust had considerable effect on the ease of ignition; but once explosive combustion had set in, they had little effect (within wide limits). It had been shown that even charcoal dust, once ignited, could give rise to a violent explosion. If the means of ignition was accompanied by concussion, it helped considerably in setting up explosive combustion.

The two best practical means of preventing the beginning of inflammation of coal dust were found to be: (1) Mixing the dust with half its weight of shale dust (1:1 mixture); and (2), damping it with 30 p.ct. of water in the form of a fine mist—the latter method only being recommended for mines with strata unaffected by water. It was shown that the 1:1 mixture of coal and shale dust was reasonably safe from ignition even when the atmosphere contained as much as 4·5 p.ct. of fire damp.

The effect of incombustible dust on the lungs was carefully studied; and it was found that only those dusts could be safely used which did not contain silica in the form of sharp pointed particles.

The lecturer illustrated the inflammation of coal dust in air experimentally, and showed several slides of large scale explosions, pressure and velocity recording instruments, automatic gas sampling apparatus, &c., used in the above-mentioned inquiry.

Several questions were answered; and a hearty vote of thanks was accorded the lecturer, to which he suitably replied.

HIGHER PRESSURES FOR TOWN SUPPLIES.

The following is an abstract of an article on this subject by Herr H. Menzel, which appeared in the "Journal für Gasbeleuchtung" for Jan. 24. The author states that, when he was entrusted with the building of entirely new works at Königshütte, in Upper Silesia, he had exceptional opportunities of testing the advantages of supplying a whole community with gas at higher pressures than are customary. Königshütte was a town of 78,000 inhabitants, which had long ago had a gas supply, but was at the time dependent on electricity only. The latter being cheap and in general use, gas had to make its way against strongly established competition; and it was open to doubt whether it would be able to hold its own. There was the additional difficulty to contend with, of maintaining mains and services in a coal-mining district.

DECIDING THE PRESSURE.

After considering the lighting apparatus available or readily obtainable, it was decided that the highest pressure suitable for interior lighting was 200 mm. [7·87 in.] Higher pressures could have been used, but only with alterations to fittings too drastic to be worth while. The whole system was, therefore, arranged with a view to a pressure at the works of between 150 and 200 mm. [5·91 and 7·87 in.], which has been actually maintained since the opening of the works. At the time of writing, it was regularly 150 mm. (day and night) at the works outlet, and 120 to 130 mm. [4·72 to 5·12 in.] at the consumers' burners. It was taken into consideration that, even if more gas was lost in delivery, compensation would be obtained in the greater ease with which faults could be located and remedied. Moreover, the volume of escaping gas increases only in proportion to the square root of the pressure; so that there was not much to be feared in this direction.

In order to obtain the increased pressure without special boosting, the holder was erected of such weight as, of itself, to give a pressure of 200 mm. Boosting may be taken into consideration later, if it is found necessary for the supply of any particular district by means of special high-pressure mains.

SAVING IN THE DISTRIBUTION SYSTEM.

By using these high pressures, it was found possible to lay mains of much smaller dimensions than could otherwise have been used. One length of 300 m. [328 yards] is of 300 mm. [11·8 in.] diameter. The whole of the rest of the supply is in two principal mains of 200 mm. [7·8 in.] diameter, with branches of 80, 100, and 125 mm. [3·1, 3·9, and 4·9 in.]. The saving in cost on the usual estimates for a town of 78,000 inhabitants was 40 p.ct. It was thought that it might be some advantage later to lay high-pressure mains feeding the system at various points. This, however, has not up to the present been found necessary.

THE SUCCESS OF THE EXPERIMENT.

The experiment at Königshütte met with extraordinary success. In spite of the established and cheap electric supply, the gas consumption has continually increased. It stands to-day at 20 litres [0·71 c.ft.] per head of the population. Its introduction was effected by means of keen propaganda, assisted by the German Commercial Gas Association. It is largely used for lighting in restaurants and business houses; and in this respect, naturally, the higher pressures are an aid to popularity. The same lighting efficiency is obtained with smaller burners and mantles than at ordinary pressures; and the light gives great satisfaction. Cookers do their work in quicker time, and gas is extensively used for baking, in which respect one great advantage of high pressure is that lighting-back is almost eliminated. Since the introduction of gas, and with the help of local propaganda, home baking is extensively practised in the town.

No difficulties were found with the consumers' appliances; the regulators supplied by the makers being in most instances sufficient. In the case of cooking and heating plant, the makers were generally ready to supply burners with smaller nozzles than usual; but in any case these are easily altered at the gas-works. In a few places cookers were supplied with nozzles that could be regulated according to requirements. The question of meters

has also given no trouble—the wet type having been used without anything unusual occurring.

ECONOMIC ADVANTAGES.

The author is of opinion that it would be of advantage to everyone to supply gas at higher pressures; and, from his experience at Königshütte, he thinks that 200 mm. should not be exceeded. The greatly increased cost of mains, and of the labour connected with their laying, is a very important feature in capital outlay. Especially should higher pressures be used in cases where it is necessary to send considerable quantities of gas to particular parts of the district. This, he maintains, can be effected far more economically by increasing the pressure, and if necessasy, laying special high-pressure mains, than by enlarging the existing mains. The consumers can also be more easily satisfied, for lighting, heating, and cooking purposes, as was found at Königshütte, where electricity was firmly established, and gas has since effected its entrance and has continually increased in popularity.

Ilford Gas Company.

The sales of gas for the half year ended Dec. 31, it was stated in the report submitted at the recent meeting, showed an increase of 17·74 p.ct. compared with the quantity sold during the corresponding period of 1918. The balance of revenue account being, as anticipated, insufficient to pay the interest charges and the statutory dividend, notice was given to increase the price of gas to 4s. 8d. per 1000 c.ft. from the Christmas quarter. Addressing the shareholders, the Chairman (Mr. William Ashmole) said the continued increase in the price of gas through no fault of the working of the undertaking, had gradually reduced the dividends payable; and these did not now give anything like a fair return on the money invested. The reduction in dividend, however, was not the only result brought about by the sliding-scale. The question of raising new capital under present conditions was a very serious one. It would be necessary for the Company to issue new stock in the near future; and the Board trusted the promised legislation might induce investors to purchase, thereby benefiting both the Company and the consumers. The consumption of gas at certain periods of the winter taxed the Company's resources to the utmost, and they were fortunate in getting through without any serious breakdown. Dividends were declared for the six months at the rate of 5¾ p.ct. per annum on the ordinary "A" and "C" stocks and 4¼ p.ct. per annum on the ordinary "B" stock, subject to income-tax. It was agreed to give a sum of a hundred guineas to the Ilford War Memorial Fund.

Hastings and St. Leonards Gas Company.

In presenting to the proprietors the accounts for the half year ended Dec. 31, the Directors stated that the sale of gas, though less than pre-war, showed (notwithstanding the unfortunate stoppage that took place in July) an increase of 4·3 p.ct. when compared with the corresponding period of the previous year. Dividends were declared at the rates prescribed by the Board of Trade Order. The Chairman (Dr. G. G. Gray) said it looked as if, for some inexplicable reason, the Government were making a straight set at gas, in spite of the acknowleged invaluable assistance rendered by the gas industry towards the successful issue of the war. So far as their Company was concerned, the present half year revealed the first ray of bright sunshine and it gave them some hope of a return to prosperity, though the clouds of rising charges and increasing expenditure were still black and ominous. Were the clouds of official interference removed and the Company at liberty to get coal where it was most convenient and cheapest, their hopes would be raised. The increased railway rates meant another £4000 a year on coal, and increases on other stores in proportion. The rift in the clouds disclosed an increase in the amount of gas sold, an increase in the number of consumers, and an increase in the appliances let and sold, and still more in the number applied for, could they have been supplied. The most cheery ray was the fact that, though there had been every prospect of their having to further raise the price of gas, and though they had given notice of such a probability, and had taken the necessary steps to prepare and validate it, and also to obtain the Order for the payment of the dividend in that event, they had not had to raise the price. They had been able to make a rebate of sevenpence per 1000 c.ft., which made the price of gas equivalent to 4s. 11d. to ordinary consumers, as from Jan. 1. Their Engineer and General Manager (Mr. C. F. Botley) had given great attention to the question of assessment for income, and rates; and, largely through his endeavours, concessions had been made to gas undertakings, which were of considerable importance.

Meter-Testing Accommodation in London.—Mainly in consequence of the enforced closing during the war of the Westminster gas-meter testing office, the accommodation for testing meters in the County of London has become totally inadequate; and the Public Control Committee recommended to the London County Council the expenditure of £3350 on extending the Harrow Road weights and measures office for meter-testing purposes. The bulk of the plant from the Westminster office was removed to Harrow Road. All the testing-offices are at present extremely congested, and five-sixths of the staff are working overtime. The extent to which the work has increased is shown by the fact that in January, 1919, the number of meters tested was 14,258; while in January, 1920, the number rose to 24,615. Two important gas-meter firms have recently made strong representations as to the serious delay in testing their meters, and have asked that steps may be taken to expedite the work. The present unsatisfactory position is aggravated by the unsuitability of the existing Spitalfields office. It is proposed to transfer this office to a more suitable site as soon as one can be found; but, in the meantime, it is essential that the present need for additional accommodation should be met without delay. The report of the Committee was last Tuesday received, and the recommendation adopted.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Section 18 of the Finance Act, 1919.

SIR,—As the enclosed circular letter, which has been sent to members of this Association, is of interest to the gas industry generally, the Income-Tax Sub-Committee of the Association would be pleased if you would find room for it in the "JOURNAL."

F. E. COOPER, Secretary,
Gas Companies' Protection Association.

5, *Victoria Street, S.W.*,
March 12, 1920.

[ENCLOSURE.]

Dear Sir,—Adverting to my letter of the 11th of November, 1919, further queries having arisen in regard to the correct interpretation of this section, the Income Tax Sub-Committee of this Association have been in consultation with the Somerset House authorities upon the matter.

It will be remembered that the one-sixth special allowance has been extended to gas-works and other similar undertakings which were not assessable to Schedule A tax, in addition to mills, factories, and other similar buildings which are so assessable, and has particular reference to buildings containing machinery which would cause vibration.

It will also be remembered that the allowance is additional to ordinary or routine repairs, and that, under the agreed scheme for income tax assessment, repairs and renewals of plant and machinery are allowed for income tax purposes. Gasholders, meters, and stoves are provided for separately under this scheme.

For the purposes of section 18 of the Finance Act, 1919, it is obviously necessary to decide two points. First, as to the buildings to be included (a list of which must be given to the District Inspector of Taxes when making a claim), and, secondly, the annual value or rack-rent of such buildings.

As regards the first point, in general terms, the allowance will be granted in respect to the annual values of buildings in which moving machinery (as distinct from static machinery) is contained, and ancillary or necessary buildings in conjunction with the same—that is to say, buildings essential to gas manufacture or distribution, which although not actually containing machinery are under the same roof as, or connected with, buildings wherein such machinery is existent. A machine-driven retort-house, carburetted water gas plant house, power house buildings (including boilerhouse), coal stores or purifying house, with conveyors, lifts, trams, or similar accessories, will be allowed under the section. On the other hand, a separate and distinct building without machinery or mechanism of any kind—such as offices or stores or the like—cannot be allowed under the section.

The annual value will necessarily be a subject of negotiation with the District Inspector of Taxes, who will, generally speaking, be prepared to entertain a value based on 5 p.ct. of the capital value of the buildings, &c.—allowance being made for the enhanced value of the same, due to structural details essential for the use of the machinery therein. In most cases, there will be available the structural value of the buildings under (pre-war) Poor Law Assessment. In some cases the original cost of construction will be known; but in other cases it will be necessary to arrive at a fair estimate of the value of buildings, based on a valuation by the company's engineer or other authority, and the amounts of the fire insurance policies might afford some corroboration of such an estimate.

It is hoped that claims under this section will be made as uniformly as possible, and that the information suggested can be given to the District Inspector of Taxes when the claims are lodged.

If difficulties arise in any case, it is suggested that the matter be put before the Association, who will take it up with the authorities.

(Signed) FRED. E. COOPER, Secretary,
Gas Companies' Protection Association.

Gas-Engines for Generating Electricity.

SIR,—I was interested in reading the abstract of the paper by Mr. John M'Intyre, of the Glasgow Gas Department, before the Scottish Junior Gas Association (Western District), and the report of the discussion in your issue for March 9.

As an engineer who has had considerable experience with steam, gas, and electricity, I can endorse most of the opinions expressed by Mr. M'Intyre, and can also congratulate him on his broad-minded views. He is more especially safe in his method of recommending the avoidance of overloading in connection with gas-engines, though this means some slight increase in capital expenditure. This increased cost, however, is soon repaid in both freedom from trouble coupled with low maintenance costs, and undoubtedly lower costs for gas per B.H.P. developed.

In his reply, Mr. M'Intyre suggests that the larger gas undertakings should instal model gas-driven generating plants for driving their auxiliary machinery, in order to show what good service a gas-engine driven generating station can give. There is much from the gas manager's point of view to recommend this practice; and as an engineer who has acted as consultant in connection with the application of electrical power to gas-works, I am open to admit that much good and satisfactory work has been accomplished in the above manner; and undoubtedly such an installation has a high publicity value.

In my own experience, however, I find that in the larger works it pays to consider the installation of steam-driven electrical generators for three or four sound reasons. First, and most important in these days, it leaves the gas which would be consumed in the gas-engines at the power house free for supply to consumers at a profit. Next, it is often possible to get the steam necessary for the generating sets from crushed and spoilt coke, the commercial value of which has been depreciated by its being reduced to breeze. This can be achieved by fitting blowers and special coke-furnaces to the boilers, at moderate cost. Very often, the substitution of electrical for mechanical driving

saves a good deal of power hitherto used in driving shafting. If this has been steam-driven, the generating plant can to some extent run on what it saves. Again, the high-speed enclosed steam-engine will run for days on end with next to no attention; and if properly chosen for its work, it will have good economy at its rated or normal load, coupled with the ability to stand-up to and deliver a very considerable overload without distress.

This point is of far greater value in a gas-works generating station than in an ordinary factory. In the factory, any increased output for emergency work is usually met by working longer hours at the same rate, or less on the engine as regards horse-power delivered. Hence a well-chosen gas-engine, run off the town's main, is a cheap, compact, and economical power producer when all points are fully considered. On the other hand, at the gas-works emergency work means that the load carried by the whole works, and especially the power station plant, must be carried out at a much higher output for some portion of the day, as the gas-works already work all the twenty-four hours. It is in such circumstances that the steam-driven generating plant proves to be invaluable.

Finally, the steam-driven plant costs very considerably less to instal per B.H.P. or per KW. of capacity, and can often be driven partly from the use of semi-waste product.

Now to deal with the publicity point of the matter. My own opinion is that it pays best to cultivate harmonious relations with one or two of one's largest consumers, and get them to realize the benefits of a gas-driven electrical installation. By keeping on good terms with such people, they will be not only pleased, but proud, to show their plants to intending consumers who wish for a similar installation. One such really good installation in a private factory is worth much more from a publicity point of view than the best run and best kept installation in a gas-works.

The first is a purely commercial plant; the second may be equally so. But the intending consumer has difficulty in keeping out of his mind the fact that it is also a specially well-kept publicity plant. Still, the final choice in this matter must always be decided by local conditions and local circumstances.

I should not like it to be thought that I have any wish to disparage the gas-engine driven installation. I have had far too much good service from the gas-engine to make any such mistake. My object has been to put the result of my experience before your readers, with the idea of indicating how the best all-round satisfaction can be obtained in this important matter; for the business of the gas manager is to make and sell gas, rather than to use it in his own works.

CONSULTANT.

March 11, 1920.

Gas Coal Shortage in the Midlands.

SIR,—At a well-attended meeting of the Midland Association of Gas Engineers and Managers held in Birmingham on Thursday afternoon, the 11th inst., the difficulty of obtaining adequate supplies of coal was considered. Several members gave instances of the straits to which they were reduced; and the undermentioned resolution was unanimously passed, to be sent to the Controller of Coal Mines and local Members of Parliament:

"This Association, which comprises over 100 Midland towns, views with great apprehension the serious shortage of gas coal. The reserve stock in several instances at important industrial towns is only two or three days, and in the majority is less than one week's supply. In view of the importance of maintaining in the national interests the gas supply, the Association urges the Controller of Coal Mines to give gas coal first priority, and to take steps to ensure that reserve stocks are built-up to four weeks consumption.

"Gas and coke are now so largely used by all classes of the community for lighting, heating, and cooking purposes, and in addition for industrial purposes, that any interruption of the supply would be disastrous.

"The members generally feel that, in view of the importance of the gas industry, they would be remiss in their duty unless they brought prominently to your notice the serious position in which the vast majority of Midland towns are now placed. In addition, many Midland towns are being seriously penalized financially by being required to take coal from outside their geographical area, and for which compensation should be paid."

JAMES R. DUFF, President,
Midland Association of Gas Engineers and Managers.

Banbury, March 13, 1920.

National Association of Technical Gas Officials.

SIR,—Like other of your readers, I was interested in reading of the formation of the above Association; and seeing their advertisements in the "JOURNAL" for the past two or three weeks, I wrote to Birmingham on Feb. 19, asking for particulars, &c. After a lapse of a week, I again wrote, suggesting that my previous letter might have gone astray. Sixteen days have now elapsed, and I am still without a reply. Evidently the Association, like some members of the Government, require "gingering up"—*Verb. sap.*

"DO IT NOW."

Benzol and Bye-Products, Ltd., has been registered with a capital of £700,000 in £1 shares, 350,000 of which are cumulative convertible preference shares.

Training Ex-Service Men at Birmingham.—A report issued by Alderman A. H. James, Divisional Director of Training for the West Midlands, shows that good progress is being made with many schemes for the training of ex-service men. A very satisfactory arrangement had been come to with the Gas-Fitters' Association and the Birmingham Gas Department. The former had agreed to the training of twelve men in Birmingham, and the Gas Department had undertaken to supervise the training and employ the men on completing their training, and supply each man with a kit of tools.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Wandsworth, Wimbledon, and Epsom District Gas Bill is one of a group of Bills to be considered by the following Committee, to meet to-day [Tuesday]: Lord Wemyss (Chairman), Earl of Lucan, Lord Elphinstone, Lord Rotherham, and Lord Wyfold.

The Edinburgh and Leith Corporations' Gas Commissioners have petitioned against alterations in the Edinburgh Boundaries Extension and Tramways Bill.

HOUSE OF COMMONS.

Progress of Bills.

Requisitions have been made to withdraw petitions against the Great Northern Railway Bill, by the North Middlesex Gas Company, the Hornsey Gas Company, the Southgate and District Gas Company, the Gas Companies' Protection Association, the Louth Gas Light Company, the Luton Gas Company, and the Wakefield Gas Light Company; and against the Portsmouth Corporation Bill, by the Portsea Island Gas Light Company.

The Great Northern Railway Bill is to be considered by a Committee consisting of Colonel Walter Guinness (Chairman), Lieutenant-Commander Dewhurst, Mr. Alfred Short, and Mr. Mallalieu, to meet to-morrow [Wednesday].

The Rochester, Chatham, and Gillingham Gas Bill will be considered by an Unopposed Bills Committee on Thursday.

The Redcar Urban District Council Gas Bill and various Corporation General Bills will come before a Committee to-day [Tuesday], consisting of Sir Francis Lowe (Chairman), Captain Knights, Mr. Joseph Johnstone, and Mr. J. Guest.

The Public Utility Companies (Capital Issues) Bill was reported, with amendments.

Gas Undertakings and Coal Shortage.

Captain BOWYER asked the President of the Board of Trade: (1) Whether he was aware that the present shortage of coal stocks to gas undertakings involved the danger of a cessation of public lighting and of the only means of cooking and lighting in use in a number of working-class homes; that there was a possibility that the public in view of this risk, would revert to the use of raw coal as fuel; and whether, in view of the fact that this would entail very considerable waste of heat energy and a still further demand upon the coal resources of the country—he would take the necessary steps to remove the possibility of these risks. (2) Whether he was aware that, although the output of coal has greatly increased since the armistice, the supplies to gas undertakings were less satisfactory than those maintained during the war; that since December, 1919 (when the rebate of 10s. per ton was allowed to domestic consumers), the supplies to gas undertakings had decreased still further; that there were over 400 gas undertakings with less than one week's supply; and what steps could be taken to improve this state of affairs, in view of the fact that colliery owners naturally preferred to obtain the full price from sales for industrial purposes rather than to have to wait to obtain from the Government the amount deducted in respect of coal used for domestic purposes.

Mr. BRIDGEMAN (the Parliamentary Secretary to the Board), who replied, said he was aware that certain gas undertakings had experienced difficulties in obtaining adequate supplies of coal. Under a scheme which was now in operation, household and domestic coal and coal for public utility undertakings was given priority over coal for industrial use. He had no evidence to show that the difference in the charge made for industrial, household, and domestic coal was responsible for the shortage referred to.

Captain BOWYER asked whether the President of the Board of Trade was aware that gas undertakings carbonized not more than 20,000,000 tons of coal per annum; that this must, however, be of a type suitable for carbonization; that if this quantity were treated as a separate item in the amounts allocated to public utility undertakings the gas undertakings would have no difficulty in obtaining it; and whether, in view of the fact that public utility undertakings were to be given priority of supply over railways and all industries, he would make the separate allocation suggested above in order to render the priority of supply referred to.

Mr. BRIDGEMAN said he was fully aware of the facts mentioned in the question, and, so far as possible, the quantities of coal allocated to gas undertakings were already dealt with separately.

Captain BOWYER asked whether an insufficient supply of coal to a gas undertaking involved loss of pressure and quality; that this resulted in a diminished quantity of gas with reduced efficiency; that, in order to make up for this, quantities of imported and expensive American gas oil were used to enrich water gas by such undertakings as were in a position to take this step; and whether, as this involved still further increasing our dependency on imports—he would state what could be done to make this practice unnecessary.

Mr. BRIDGEMAN replied that all possible steps were being taken to ensure a sufficiency of supplies to gas undertakings. At present it was not possible to avoid the use of imported gas oil, as the coal-gas plant capacity of many large gas undertakings was such that, without the use of oil and water-gas plant, it would be quite impossible for the demand to be met. Further, in the interests of coal conservation, it was important that full use should be made of water-gas plant.

Water Power and Electricity Generation.

Lieut.-Col. MURRAY asked the Minister of Transport whether steps were being taken by the Electricity Commissioners to examine into the use of water power in various parts of the country for the generation of electricity.

Mr. NEAL, who replied, said that the question was being inquired

into by the Water Power Resources Committee, appointed by the Board of Trade and the Ministry of Health, of which Sir John Snell, the Chief Electricity Commissioner, was Chairman. This Committee were drafting their report, to which it would be the duty of the Electricity Commissioners to give the necessary consideration.

Trade Union Combinations.

Mr. Higham asked if the Prime Minister if the Committee on Trusts were investigating the trade union combine, in order that the people generally might be informed as to what extent this combine's restriction on output, their limitation of hours of employment, and the enormous increase of wages they had secured for those employed in the workshops and factories was increasing the cost of production, and what effect this action of the combine had on the present high cost of living.

Mr. Bridgeman (Parliamentary Secretary to the Board of Trade), who replied, said the answer to the question was in the negative.

Mr. Higham asked why a combine such as the "Triple Alliance" should be less liable to investigation than any combination of capitalists.

The Speaker replied that that was a matter for argument.

PUBLIC UTILITY COMPANIES (CAPITAL ISSUES) BILL.

The Bill "to provide for the variation of the provisions regulating the raising of capital by companies carrying on certain statutory undertakings" (the text of which was given in the "Journal" for Feb. 17 last, p. 375) was last Thursday considered by Standing Committee B. Sir Watson Rutherford presided.

Clause 1 of the Bill provides:

> Where a company are authorized by Special Act to raise capital by the issue of stock or the borrowing of money for the purpose of carrying on any gas or water undertaking, the company may, if they think fit, notwithstanding anything in the Special Act, with the consent of the Board of Trade, which consent may be given subject to such terms and conditions as appear to the Board to be expedient, (*a*) offer for sale by auction or tender any such stock at a reserve price lower than the nominal amount of the stock.

In connection with sub-clause (*a*), Sir H. Cowan had given notice of an amendment to substitute for the words "by auction or tender" the words "in such manner as the company may approve."

Before the Committee proceeded with the consideration of the Bill, the members were handed a statement prepared by the Gas Companies' Protection Association in support of the amendment by Sir H. Cowan. The statement was in the following terms:

Having regard to the extreme severity with which statutory conditions, coupled with war and post-war circumstances, have pressed upon gas undertakings, the Gas Companies' Protection Association may perhaps be excused for troubling honourable members with the following statement.

The Association represents many millions of capital invested in London and Provincial gas undertakings and includes in its membership companies representing all scales of magnitude from the largest to the smallest. The amendments referred to above are proposed at the instance of the Association, and all are considered extremely desirable, not only in the interests of gas companies themselves, but also in those of the consumers. For the most part the amendments speak for themselves, but that to clause 1 sub-clause (*a*) is regarded as of the utmost importance. The Association has no hesitation in saying that if the sub-clause is to be of the slightest benefit to a very large number of gas companies in present circumstances, relief from the obligation to sell their capital by auction or tender is an absolute necessity. At the best, the auction clauses, even in their latest form, are cumbrous, and the formalities imposed thereby consume a great deal of time.

The following is shortly the procedure that must be adopted according to the latest Model Bill form. Twenty-eight days' notice of the intended sale has to be given to the local authorities and to the Secretary of the London Stock Exchange. Shares not sold may then be offered at the reserve price to the holders of ordinary and preference shares, and to the employees and the consumers. Any shares not then sold must again be offered for sale as in the first instance. Any shares not then sold 'may be disposed of at such price, and in such manner, as the directors may determine for the purpose of realizing the best price obtainable.' The clause in this form applies to most companies who have obtained their powers in recent years. It is submitted that the clause, even in this form, is quite unsuitable to present circumstances. The risk of a failure to sell by auction or tender is a very real one; and the directors are much handicapped when, after two failures, they endeavour to dispose of the unsold capital privately, as by that time the credit of the company is damaged by the previous failures. Many of the companies, however, who obtained their powers in earlier years have not even this ultimate opportunity of placing such unsold capital privately, as such companies must continue to sell by auction or tender at successive lower prices until the whole of the offered capital is disposed of. Honourable members can realize for themselves how great is the risk in the case of, say, a comparatively small company (of which class there are many hundreds) of failure in these times to sell its capital by auction or tender, and the damage to the credit of such a company consequent upon the first failure is relatively much greater in cases where a company has only a very limited local circle of possible investors to whom to appeal. Further, these local investors, consisting for the most part of tradesmen and others, in these days require more capital than formerly in their own businesses. Consequently there is less local capital available, and what there is has many investments offered to it yielding a higher rate of dividend than any gas company can offer under existing conditions. On the other hand, investments in small local gas undertakings do not attract the general investor.

It is confidently asserted that in the circumstances referred to the auction clauses defeat the objects for which they were designed, and would only result, in cases where the capital could be placed at some price, in that price being lower than it need have been if the Directors had been allowed sufficient latitude at the outset to endeavour to place the capital where and at the best price they thought they could get. As the whole clause is subject to the consent of the Board of Trade, it is submitted that the interests of the consumer are sufficiently safeguarded. The time must come, sooner or later, when the gas industry as a whole will have to raise capital amounting in the aggregate to some millions, as, owing to the very serious rise in the cost of labour, coal, and all materials, each company now requires for any particular capital expenditure very much more capital (perhaps three or four times as much) than would have sufficed under pre-war conditions. Unless the raising of this capital is facilitated in every possible way, the companies will find it quite impossible to meet the demands of their consumers. Honourable members will see therefore that this is not merely a shareholder's matter, but one that directly affects the consumer.

As regards the amendment to the schedule, it is considered desirable to provide for cases where it can be proved to the satisfaction of the Board of Trade that it would be unreasonable to load the capital account of a company for all time with abnormal expenditure due to circumstances arising out of the war.

Mr. Bridgeman (the Parliamentary Secretary to the Board of Trade) moved to omit the words "gas or water undertaking," and to insert "undertaking to which this Act applies." Electricity and tramway companies were, he said, likely to suffer from the same disabilities under their Special Acts which applied to gas and water companies; and this amendment was intended to meet the situation.

Sir F. Banbury said he was afraid that when the Bill went back to the House the Speaker might possibly rule that it was a different Bill from that which passed the second reading.

The Chairman said that, so far as he was concerned, he ruled that the amendment, and another in consequence, was in order.

Mr. Bridgeman said that he did not want to put the Committee in an embarrassing position. But even if the Speaker ruled in the way suggested by Sir F. Banbury, it was entirely for the Committee to say whether they wished to put in the words suggested or not. He might, however, if the Committee so desired, withdraw the amendment at this stage, and meantime consult the Speaker. If the Speaker concurred, he could put the amendment down on the report stage.

The Committee agreed to this suggestion, and the amendment was accordingly withdrawn.

Sir H. Cowan, on behalf of the National Gas Council and the Gas Companies' Protection Association, moved to leave out the words "by auction or tender" in sub-section (*a*) of clause 1, and to insert the words "in such manner as the company may approve." He argued that if the words which he wanted omitted were allowed to stand, they would defeat the object of the Bill.

Sir F. Banbury suggested that if the words "by auction or tender" were omitted, and the words "to the public" substituted, it would prevent shares being issued to existing shareholders only.

Mr. Bridgeman said he would be quite prepared to accept Sir F. Banbury's proposal.

The Committee agreed to this course; and clause 1, as amended, stood part of the Bill.

The wording of the sub-clause now is: "Offer for sale to the public any such stock at a price lower than the nominal amount of the stock."

An amendment to clause 2, moved by Sir H. Cowan, to the effect that the Act should continue in force for five years instead of two, was accepted, and the clause as amended stood part of the Bill.

The Bill, as amended, was ordered to be reported to the House.

Fatal Accident at Halifax.—An inquest was held at Halifax into the death of Owen Heggarty, a Corporation gas worker, who fell down a coke-hole. The coke-holes near the retorts were about 4 ft. square and 17 ft. deep. Heggarty was said to be an experienced man. The Coroner, in returning a verdict of "Death from misadventure," suggested that, for safety, the management might consider allowing more space between the retorts and the coke-holes.

An Inadequate Dividend at Worthing.—An increase in the consumption of gas amounting to 11¾ p.ct., and a dividend at the rate of 3¾ p.ct. per annum, were the main features of the report for the past half year of the Directors of the Worthing Gas Light and Coke Company. At the meeting, the Chairman (Mr. William Cash) expressed the opinion that this "was a totally inadequate return to the proprietors for their money." When new machinery which it was proposed to instal at the works was in operation, there would be a considerable saving in working expenses.

Richmond (Surrey) Gas Company.—In the course of his address at the half-yearly meeting of the Company, Mr. Henry Pullman (the Chairman) pointed out that the Directors recommended a dividend of 3¾ p.ct., because, in the circumstances in which they found themselves, brought about by the effects of the war, they were not permitted to pay more. Owing to the sliding-scale, as the charge for gas increased, this small dividend was all that was allowed. The Company had an increase of business of 10 p.ct. in the balance-sheet period; but this was of no advantage to the shareholders. The whole of the benefit of the reduction of 10s. per ton in the price of coal had to go to the household consumers; but seeing that over 90 p.ct. of the gas sent out by the Company was used for domestic purposes, it did not seem fair that the long-suffering shareholder should not have some part at least of the benefit. With the cost of labour now so heavy, the adoption of machinery wherever advantageous was having the consideration of the Board; and considerable advance had been made at the works to this end. Drawing attention to the financial difficulties of the industry, he remarked that over 100 millions are invested in statutory undertakings alone; and it is computed that this capital has deteriorated to the extent of £45 millions, for no cause over which the industry has had any control. A hearty vote of thanks was accorded to Mr. E. G. Hutchinson (the Engineer and Manager), the Acting Secretary, and the staff and workmen for their services.

LEGAL INTELLIGENCE.

DAMAGES FOR GAS POISONING.

LEIBRICH v. MANCHESTER CORPORATION.

An action for damages for personal injuries alleged to have been caused by poisoning through leakage from a gas-main was heard before Mr. Justice BRAY at the Manchester Assizes last week (starting on Monday). The plaintiff was Mrs. Mary Ann Leibrich, a widow, living at No. 22, Sanderson Street, Miles Platting; while the defendants were the Manchester Corporation.

Mr. ASHTON, K.C., and Mr. ROY RYCROFT appeared for the plaintiff; the defendants were represented by Mr. ATKINSON, K.C., and Mr. OLIVER.

Mr. ASHTON, in outlining the plaintiff's case, said that when her daughter got up about 4.45 a.m. on July 23, 1918, and was going downstairs, she noticed a strong smell of gas. She opened the door of the parlour, in which room her father and mother slept, and the force of gas knocked her back. She found her father lying dead in bed and her mother unconscious and frothing at the mouth. The mother was taken to Ancoats Hospital, where she remained unconscious until the evening of the next day. As a result of the gas poisoning, plaintiff now suffered from heart trouble. Prior to the accident her heart, for all practical purposes, was a very good heart; but since then it had been a very bad one. It would be for His Lordship to decide what had turned plaintiff from a healthy old woman into an invalid. The learned Counsel explained that, apart from the alleged negligence, plaintiff complained that the escape of gas was a nuisance. As to the negligence, the pipes were laid in 1871; and the defendants in their answers to interrogatories admitted that they had never examined them since. The accident occurred in July, 1918. The previous Christmas a Mrs. Edge and her four children, who lived round the corner from plaintiff, were poisoned with gas. Afterwards the Corporation took up the old main (part of the same main as plaintiff's), and a new length was put in. In July, 1918, after the trouble at plaintiff's, new pipes were put in. He (Mr. Ashton) contended that it was negligent to leave the old pipes uninspected for so long. The defence raised the issue that there was a subsidence under the gas-main caused by a third party removing earth close by. But he (Mr. Ashton) submitted that a third party had nothing to do with the subsidence. The interference with the ground took place the previous June, when a workman removed some earth two yards away from the gas-pipe, to clear a stoppage in the drains.

Alice Loynd, daughter of plaintiff, spoke to finding her father dead in bed on July 23, and her mother unconscious from gas poisoning.

Plaintiff, in her evidence, said that there was no smell of gas in the parlour when she and her husband went to bed on July 22; and she remembered nothing till she woke in Ancoats Hospital next day.

Jas. Gardner, a drainer for a private contractor, deposed to raising a flag, 3 ft. long by 18 in. wide, on the footpath in front of plaintiff's house in June, 1918, and removing earth for a depth of 18 in., in order to clear-out a blocked drain.

Dr. *A. Fraser* declared that plaintiff was suffering from heart trouble, partially as a result of the accident, and that her expectation of life had been cut down as a result of her injury.

Mr. ATKINSON, for the defence, explained that when the pipes were taken out after the occurrence, it was found that there was a new crack in one of the joints. Under the crack there was a cavity of a few inches for a distance of 12 in. or 18 in. This was enough to take the support from under the cracked joint. The trouble was soon dealt with. The defendants said that no one except the Corporation had any right to interfere with the flags on any pavement. It had been found that at some time work had been done on the drain-pipes near the house, without the knowledge of the Corporation. This had happened at least twice before Gardner disturbed the ground. The defendants' view was that the subsidence was caused by water from the surface percolating through the ground which, instead of being solid, was loosely filled in, and gradually caused a slight subsidence under the pipe. There were over 1000 miles of gas-mains in Manchester, and it could not be said that the Corporation should take them up periodically.

Mr. Justice BRAY: That fact is no answer at all.

Mr. ATKINSON also stated that the leakage of gas from the Manchester mains was exceptionally small, and less than in most other large cities.

Mr. *William Newbigging*, the Engineer of Manchester Corporation Gas Department, gave evidence that when he examined the main, some time after the accident, it was in as good a condition as when it was put in in 1871.

J. S. Prince, a pipe-layer for the Manchester Corporation, said that when he went to the place on July 23—the day of the mishap—he found the flagging in front of the house had sunk to a V shape. On opening the ground, he found a new split in the gas-main joint. There was a cavity of 4 in. under the main, and the ground all round was very loose.

Replying to His LORDSHIP, witness said he had noticed the V shaped subsidence before July 23. It might have been there a year before.

Cross-examined by Mr. ASHTON, he said at the inquest that he believed the subsidence to be due to recent rainfall.

Dr. *Tylecote*, of the Manchester Infirmary, expressed the opinion that the results of gas poisoning had practically passed away when he examined plaintiff in February. She had bad heart disease of long standing, and he was surprised that she had lived to be 67, with her heart in its present condition.

Mr. *Walker*, an inspector of drainage for the Manchester Corporation, said the last drainage work done at this particular spot by his department was 1904.

Herbert Clayton, the contractor who did the work, said that one of the joints his men made had been taken out and a fresh one substituted.

Mr. *C. J. Lomax*, of Manchester, said he was instructed by the Corporation to make an examination, and report what he considered was the cause of the gas escape. He did so about the end of October or the beginning of November last year. On going into the cellar of plaintiff's house, he found a cavity in the cellar wall immediately under the window into which he pushed a stick for a distance of 18 in. This would allow water from the cellar when it was flooded to flow through the cavity and down the drain trench into the sewer. In his view the flowing of water from the cellar had caused a settlement of the trench; and, in addition, there had been water percolating from the surface. He did not think the actual cavity affected the joint at all; but his theory was that the crack was caused by a sudden impact on the surface above the cavity.

When the hearing of the case was resumed on Tuesday,

Mr. ATKINSON argued that as the Corporation were under statutory obligation to send gas through the mains under pressure, negligence must be found before they could be hit.

Mr. ASHTON urged that his Lordship should find negligence because a Corporation employee had on the previous day seen the subsidence in front of the plaintiff's house; and if he had reported it, the matter might have been put right, and the accident prevented.

His LORDSHIP, giving judgment for the plaintiff, said there was undoubtedly a nuisance; and there was nothing in the parliamentary authority given to the Corporation to exempt them from liability. Gas did escape into the plaintiff's house from the main, and did a very grave injury. It killed the husband and very nearly killed the wife. His view was that it was not necessary to prove negligence. Unfortunately, owing to gross carelessness on the part of the defendants, the pipe had not been preserved. He did not suggest that the Manchester Corporation deliberately did away with it; but it created a great difficulty. If he had to determine the cause of the depression of the ground under the main, he would find the greatest difficulty in doing it. It was impossible for him to say that there was any interference by a third party which caused the subsidence; and he found, in fact, that there was no interference. He could not definitely say what was the cause of the subsidence. He did not find either way on the question of negligence. His finding was that the escape of gas was a nuisance caused by the Corporation; and that they were responsible for the injury they had inflicted on the plaintiff. He was satisfied that she was not suffering from heart trouble at the time of the accident. He fixed damages at £250, plaintiff to be allowed all the costs of the action.

A stay of the action was refused.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for March 10.]

Nos. 6110—6927.

ALBRECHTSEN, H.—"Gas-cookers." No. 6676.
BROWNE, A.—"Gaseous-fuel burners." No. 6500.
CHARLES, A.—"Flexible pipe couplings." No. 6842.
CHEMISCHE FABRIK RHENANIA.—"Extraction of sulphur from gases containing sulphuretted hydrogen or sulphurous acid." No. 6921.
CLEVELAND GAS-BURNER AND APPLIANCE COMPANY.—See Browne, A. No. 6500.
DICKENS, C.—"Internally-heated gas-irons." No. 6618.
EVANS, T.—"Suction-gas producer plant." No. 6165.
FEATHERSTONE, W. B.—"Gas-fire, generator, and smokeless fuel producer." No. 6586.
FOSTER, T. J.—"Gas-lamps, &c." No. 6616.
GILBERT AND BARKER MANUFACTURING COMPANY.—"Burner." No. 6193.
GRAHAM, T.—"Incandescent gas-burners." No. 6749.
HUDSON, E. H.—"Gas and air adjuster for gas appliances." No. 6834.
INGRAM AND KEMP.—See Foster, T. J. No. 6616.
IVERSON, S. I.—See Albrechtsen, H. No. 6676.
JOFEH, J.—"Coin-freed apparatus." No. 6534.
MOLL, A. D.—See Graham, T. No. 6749.
PROJAHN, F.—See Chemische Fabrik Rhenania. No. 6921.
RICHMOND GAS STOVE AND METER COMPANY.—See Dickens, C. No. 6618.
SCHNEIDER ET CIE.—"Hooping-bands for movable blades of steam or gas turbines." No. 6772.
SCHROEDER, F. W.—"Incandescent gas-burners." No. 6362.
SLOMAN, J.—"Inverted gas-mantles." No. 6477.
WELSBACH COMPANY.—"Manufacture of gas lighting devices." No 6397.
WHITE, J. W.—"Gas producers, &c." No. 6451.

Ilkeston Gas Undertaking.—Dealing with the financial position of the Corporation gas undertaking, Mr. Macdonald, at the last meeting of the Ilkeston Town Council, moved the reference back to the Gas Committee of the estimates for the ensuing year. He complained that, if the estimates matured, the result would be a reduction by one-half of the reserve surplus now amounting to over £8000. He urged that a municipal trading concern should be made to pay its way. The reserve fund, in reality, represented only a book-balance. There was a very small stock of coal in hand, and money was needed for various purchases. The object of the Committee, during the time he was Chairman, was to build-up a reserve fund with which to purchase a water-gas plant. A great mistake had been made by abolishing meter rents, and thereby throwing away a certain annual revenue of £2000. The amendment for referring the matter back was, however, defeated. Mr. W. Smith characterized Mr. Macdonald's attitude as inconsistent, as when it was proposed that meter-rents should be abolished, he moved that there should instead be a reduction in the power of the gas which would have cost £3000, or £600 more than the amount of the rents abolished.

MISCELLANEOUS NEWS.

THE KING'S NATIONAL ROLL.

Response of Patriotic Employers.

The first edition of the King's National Roll, which is now in circulation, contains nearly 10,000 names of patriotic employers who had up to the end of 1919 given the necessary undertaking to employ an agreed percentage of ex-service men on their staffs. Copies of the book, which consists of over 300 pages, are to be placed in Employment Exchanges throughout the country, with Trade Unions, Employers' Federations, Ex-Service Men's Organizations, free public libraries, and other public buildings; while every employer whose offer to embrace the scheme has been accepted will also receive a copy. His Majesty the King and Queen Alexandra stand at the head of the list in the first edition; and the roll, for purposes of easy reference, has been arranged in alphabetical order by counties.

Since the first edition went to press, the number of employers qualifying for the use of the "Seal of Honour" has been increased by over 2000; and these, with the subsequent additions to the roll, will appear in future editions. While it is gratifying to know that the number of employers who are willing to employ disabled ex-service men is growing, it must not be forgotten that the supply of disabled men is unhappily by no means exhausted. There are still in the hospitals some thousands of men who were wounded in the war, for all of whom will have to be found positions in civilian life as soon as their discharge from hospital permits of them taking up work for which they are fitted. Every employer of labour, large and small alike, can help in absorbing these men back into industry. All that an employer has to do is to sign an undertaking that his staff shall include a percentage of disabled men—the percentage being agreed upon between him and the Local Employment Committee at the nearest Employment Exchange. If the employer is willing to give the undertaking but has difficulty in finding men to enable him to qualify for the insertion of his name on the National Roll, the local Employment Committee and the officials of the local Employment Exchanges will do their best to obtain the necessary number of men required.

The majority of the employers whose names appear in the first edition of the National Roll have been asked their opinions with regard to the employment of disabled men; and in almost every case the reply which has been forthcoming has paid a tribute not only to their eagerness to work, but has expressed satisfaction with regard to their efficiency as well.

Glancing casually through the list, the names of various gas undertakings and manufacturers are noted.

SHEFFIELD GAS COMPANY.

Improved Outlook.

The Ordinary General Meeting of the Company (the 120th) was held on Monday last week—Col. H. K. Stephenson, D.S.O., M.P., presiding.

The Chairman said he was very glad to meet the shareholders with a much better report than a year ago, and one very far removed in character from the tale of trouble it was his unfortunate duty to have to unfold to them in March, 1918, when he had just taken over the chairmanship of the Company. Although they were to-day sailing in smoother waters than at any time since the war, they were by no means clear of their difficulties, and were still suffering from the operation of obsolete Acts of Parliament urgently calling for repeal, and were subject to the tender mercies of the Coal Controller, whose mandates up to now had been more calculated to create confusion than to inspire respect. They had, however, begun to reap the benefit of the renewals of plant and reforms in organization carried out since the armistice; and, though much remained to be done, they faced the future with confidence.

POINTS FROM THE WORKING.

Turning to details, he said they would remember that at the last annual meeting they were faced with a deficit of £22,000. Not only had they wiped-out this deficit and replaced it by a carry-forward of £5745 (after payment of dividends), but they had been able to provide for a larger expenditure on renewals than in any previous year. After what he had told them at the last annual meeting he need hardly assure them of the necessity of spending money on renewals in order to restore the plant to normal working conditions. The strain under which the plant was worked during the war was altogether abnormal; and it was impossible to do any but the most vital repairs without stopping portions of the works and thus affecting the supplies of gas and residuals so imperatively demanded. Not until the armistice reduced the strain upon their resources could they commence this very necessary work, which was now being carried out at a time when both labour and material were alike scarce and costly. It was, however, pleasant to note that if their efforts during the war met with somewhat scant gratitude, the improved supply of gas which they were now in a position to give afforded widespread satisfaction, and even evoked praise from the least generous of their critics.

In view of what he had said, they would realize that the reduction in the demand for gas during the first nine months of 1919, as mentioned in the report, was a blessing in disguise, because it enabled them to put their house in order, and, so to speak, to repair the ravages of war. Since the beginning of October last the demand for gas had been in excess of that during the corresponding period of 1918, but he was glad to say that their improved working conditions enabled them to meet satisfactorily this increased demand. For the month of

USE Simmance's

DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

January last they had sold 10¼ p.ct. more gas than in January, 1919. On Aug. 1, in consequence of the 6s. per ton advance in the price of coal and of the general increase of costs all round, the Directors were compelled to increase the price of gas from 3s. 3d. to 4s. per 1000 c.ft., which, under their Act of Parliament, had the effect of automatically reducing the dividend on the "B" stock to 4 p.ct., and on the "C" stock to 3½ p.ct., while the Directors were deprived of their fees. On Dec. 1 a further advance in wages of 5s. per week and 12½ p.ct. had been granted to all workmen; and in addition to this they had now to face the large increase in railway rates. But the Directors had every hope that it would not be necessary to increase the price of gas to meet these extra costs.

It might, however, not be out of place to call attention to the great increase in the cost of labour since 1914. In that year the total wages bill had been less than £118,000; while in 1919 it had been nearly £299,000—an increase of £181,000—over two-and-a-half times as much. The increased cost of labour, added to the increased cost of coal and machinery (in fact, of everything required for the production of gas) made it impossible to sell gas at pre-war rates; but the Government still obliged gas undertakings to work under the pre-war sliding-scale, and to reduce their dividends if they increased their prices to meet the increased costs. Seeing that both wages and coal prices had been fixed for them by Government departments, the failure of the Government to adjust the sliding-scale to the increased cost of production was beyond explanation. During the war gas undertakings had rendered the Government invaluable assistance; and yet no other industry had been similarly penalized. The Food Controller, when fixing food prices, took care to leave a reasonable profit for the wholesale dealer and the retailer, while the Coal Controller gave colliery owners their pre-war profits. The Government, however, had up to now refused to allow gas undertakings to pay their pre-war very modest dividends in conjunction with the increased prices for gas which the increased cost of production had necessitated.

Very strong representations had been made to the Board of Trade through the National Gas Council, and the Board had promised to bring in at an early date a Bill to relieve the position. As, however, the Bill had not yet been produced, he was unable to say exactly the extent of the relief it would afford; but he hoped that they would be able to pay at least their pre-war dividend (and, perhaps he might add, the Directors' fees) under some sliding-scale adjusted to post-war conditions. When one remembered the rate of interest which the Government had to give for borrowed money, it would not appear unreasonable if an increase on the pre-war rate of dividend were to be sanctioned.

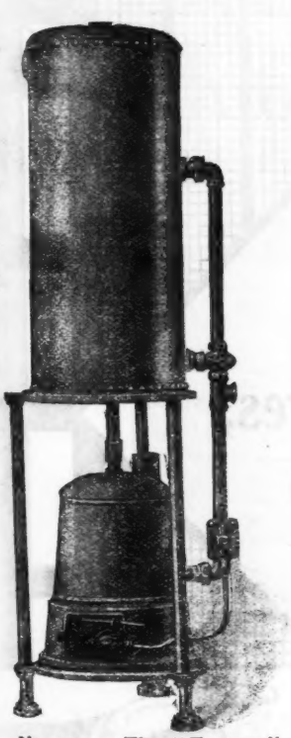
THE COAL CONTROLLER'S ACTION.

He had already referred to the inconveniences arising from the decrees of the Coal Controller. No decree of his had been more disconcerting, so far as the gas undertakings were concerned, than the Coal (Pit's Mouth) Prices Order and Direction, 1919, whereby 10s. per ton reduction in the price of coal had been given to the domestic consumer—to be applied also in the form of a rebate on gas used for domestic purposes. They calculated that the rebate to consumers of gas for domestic purposes would work out, so far as their Company were concerned, to 7d. per 1000 c.ft. Hitherto, when an increase in the price of coal had been decreed by the Coal Controller, it had necessitated an increase in the price of gas all round, with the result (under the sliding-scale) of a decrease in dividends. In the present case the decrease of 10s. per ton on coal was by Government decree to affect the domestic consumer only in the form of a rebate, without a reduction in price of gas or consequent increase of dividends. The rebate amounted to 7d., which in effect reduced the price of gas to the domestic consumer from 4s. to 3s. 5d. per 1000 c.ft. But if they could have made an all-round reduction in price to 3s. 6d. for industrial and domestic consumers alike, they would, under their sliding-scale, have been able to increase the dividend on the "B" stock by 1 p.ct., bringing it up to 5 p.ct. The domestic consumer would only have been 1d. per 1000 c.ft. worse off; while the industrial consumer would have been 6d. per 1000 c.ft. better off. In fact, if the Coal Controller had desired an arrangement which would do the maximum amount of harm to the undertaking, and confer the minimum amount of benefit upon the consumer, he could not have achieved his object with greater success. In any case this action gave them a still greater claim than they had before on the Government, that they should deal with a paradoxical situation in which even a successful undertaking like theirs found itself.

INDUSTRIAL GAS CONSUMPTION.

The sale of gas apparatus for heating and cooking was being well maintained—no fewer than 3080 appliances having been sold during the year; while the continued popularity of gas-furnaces was evidenced by the sale of 233 furnaces to the value of £9338, with an hourly consumption of 97,140 c.ft. Gas-engines reaching a total of 868 H.P. had been fixed; while it was satisfactory to record that several works in the city had installed high-pressure incandescent gas lighting, which showed that gas still held its own as an illuminating agent if people were prepared to pay an adequate price for what they received. The maintenance of burners (which was dropped during the war owing to shortage of labour) had recently been brought into operation again, and should prove an asset to the Company and a benefit to consumers. Already over 3000 burners were being regularly maintained; and this number was being steadily increased. The unaccounted-for gas was 3·98 p.ct., which was a satisfactory tribute to the condition of the distribution system. Since last September the make of gas per ton of coal carbonized had considerably improved at all the works; and this had assisted the Company to cope with the extra demand and give adequate pressures in the district.

The Company had now been taking coke-oven gas from the Tinsley Park Colliery for over twelve months; and this also had helped them. But it had at the same time caused considerable difficulty owing to the great variation in the B.Th.U. value of the gas. The colliery were doing their best to regularize the quality of the coal sent out,



No. 424. The "Energy."
Stands can be supplied to any desired height.

The "Main" Circulating Water Heater.

THIS Gas Heater is constructed throughout of strong cast iron with corrugated inner and outer jackets giving an unprecedented heating surface. The gases, after heating the inner jacket, are drawn to the base, and to reach the flue outlet must travel over the outer casing, thus utilising the heat to the utmost.

A really efficient thermostat is fitted; and the heat-retaining outside casing is made of steel, porcelain enamelled, giving the heater a most attractive appearance.

A sample will convince you of its efficiency.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N.18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

and he hoped that the Company might as a result rely upon a more constant B.Th.U. value being supplied. In the early part of the year an agreement was made with the Orgreave Colliery to supply the Company with coke-oven gas; and mains from the colliery to the Effingham Street works had already been laid. It was hoped that the supply would be in operation during the summer months.

When dealing with the accounts he referred to the amount of money they were spending on renewals. These included, at Grimesthorpe, a renewal of the chemical works—comprising sulphuric acid plant with oxide burners and nitrating plant; and a sulphate of ammonia plant complete with saturator and neutralizing plant. These renewals were imperative; and he mentioned that the sulphate of ammonia plant would deal with the whole of the ammoniacal liquor produced at the three works of the Company. At Neepsend they were putting in a complete carburetted water gas plant, including extensions to the boilers and purifiers.

RECENT PURCHASE NEGOTIATIONS.

In view of the negotiations which took place during the year with the Corporation having broke-down, he did not think he need say much about them. The Directors held the view that if the Corporation seriously desired to acquire the gas undertaking, it was their duty not to refuse, on the shareholders' behalf, to give them an opportunity of so doing. Not that they thought that the community would be better served if the undertaking were in the hands of the Corporation, but because (as the latter already owned the electricity and water undertakings) there would be an element of fitness and possibly some convenience in their owning the gas undertaking. Consequently, in response to a request received from the Corporation, they conceived it to be their duty to quote terms for the transfer of the undertaking which they could recommend the shareholders to accept. After somewhat prolonged negotiation, an agreement was reached with the Parliamentary Committee of the Corporation; but the proposal was turned-down by the City Council itself, who also withdrew from their Bill before Parliament their application for powers to purchase the undertaking compulsorily, failing agreement. This change of front on the part of the Corporation was the more remarkable as it was currently reported that they were advised that the terms which the Directors quoted, subject to the approval of the shareholders, were distinctly more generous than the Corporation could possibly expect to secure either by arbitration or compulsory purchase. The Company had, of course, no reason to be displeased at the result, which constituted a sufficient testimony to the confidence which the citizens of Sheffield had in the continued efficiency of the gas undertaking under its present ownership and management.

In conclusion, Col. Stephenson referred to the resignation of the seat on the Board held by Col. Sinclair White, and the position of General Manager for so many years occupied by Mr. Hanbury Thomas. He also expressed the obligations of the Board to their loyal and hard-working staff, and especially to their new General Manager, Mr. Ralph Halkett, who had been with them since last June, and their Engineer, Mr. Chamberlain, who succeeded Mr. Johns on the latter's appointment to Swansea last September. He was happy to report that the workmen were showing an increasing interest in their work and in improving the efficiency of the undertaking—a very satisfactory feature. He moved that the report be approved.

Mr. W. J. Wood seconded the motion.

A Shareholder on the Government Attitude.

Mr. Bernard Hobson thought that if they were to wait until the Government brought in a Bill to improve their possibility of dividends they might have to wait till the Greek Kalends. In a complaint of this kind the Government was on the side of those who had the most votes; and they were inclined to act in what they believed to be the interests of the consumers instead of the companies. The South Metropolitan Gas Company were bringing forward what they believed to be a fair scheme, under which the authorized dividend was to be 6 p.ct., which, considering the present value of money, was a perfectly reasonable proposition. It occurred to him that if the Government did not show some energy in bringing forward a Bill, it might be convenient for the Company—either alone or in conjunction with some other companies—to introduce a Bill. Nothing would be gained by sitting still, and taking a passive attitude; and nobody would take up their interests because of what he might call a platonic love of the undertaking. He, therefore, made the suggestion that unless the Government did something for gas companies the gas companies should take action themselves.

The Chairman said the matter had not been lost sight of. They had given every consideration to it; and they had been in constant communication with their Parliamentary Agent and other gas companies. The National Gas Council had asked them not to take individual action, because they themselves were in touch with the Board of Trade, and it was desirable that the matter should be dealt with as a whole. "If they don't bring a Bill forward this session," added the Chairman, "I can say, on behalf of the Board, that we shall go to Parliament ourselves with an independent Bill of our own."

The resolution was then carried.

The dividends recommended were declared—viz., £2 10s. p.ct. on the "A" stock, £2 1s. 8d. p.ct. on the "B" stock, and £1 15s. 5d. p.ct. on the "C" stock.

TYNEMOUTH GAS COMPANY.

The Annual Meeting of the Company on Monday last week was presided over by Mr. J. B. Williamson, J.P.

The Chairman, in moving the adoption of the report and accounts, said the amount of business in the different departments was remarkable, and was considerably greater than that recorded in any previous year. The gas sold amounted to 577 million c.ft.—an increase of 67

TELEPHONE—
64 & 2296 CENTRAL.
TELEGRAPHIC ADDRESS—
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For the latest improvements in Condensers, Purifiers, "Scrubber-Washers," Valves, and Spiral Gasholders

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R. & J. DEMPSTER, LTD.

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London Office—
CONNAUGHT MANSIONS,
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millions and equal to an increase of 13¾ p.ct. over the sales of the previous year. It was of interest to note that the sales of gas during the past year exceeded that of their previous record in 1914 by 8 p.ct.; so that they had now more than overtaken the setback caused by the war. The demand for gas appliances continued to be great; and there was every prospect of a satisfactory increase in the output of gas during the present year. The revenue from gas was £102,000 against £82,800 in 1918. Residuals had helped enormously to improve their financial position, in what would otherwise have been an adverse year. Together, they had realized £82,900—an increase of nearly £39,000 over the previous twelvemonth. This was largely due to the high prices obtained for export coke. For the whole year their exports totalled 18,000 tons. Tar and sulphate of ammonia also realized good prices, and, along with coke, helped materially to meet the very alarming increase in the coal bill, the higher wages, and the great advance in the cost of all materials. In 1914, they paid £31,000 for coals; in 1918, £49,000; and last year, £70,000. For the first time in the history of the Company the total return from residuals had exceeded the coal bill. After referring to the increases in the cost of all materials, labour, and the reduction in working hours, it was decided to make application to the Board of Trade for financial relief under the Temporary Increase of Charges Act, 1918. During June last year, they obtained an Order granting them permission to increase their maximum gas prices by 1s. per 1000 c.ft. all round. After careful consideration, it was decided to increase the price by 6d. per 1000 c.ft., as from the reading of the meters in July last. Within three weeks the Government announced a further increase in the price of coal of 6s. per ton, which represented an advance in their coal bill of nearly £16,000 per annum. Under this so-called Relief Order the shareholders had been compelled to suffer a loss of 1¼ p.ct. in dividend on all ordinary stock over the whole year. It was expected that a Bill would shortly be introduced into Parliament in which, in addition to better financial clauses, there would be included certain regulations as to the pressure and quality of gas. Certain definite proposals would also be embodied in the Act for the sale of gas upon its calorific power or heat unit basis. They were now faced with a large amount of renewals—delayed more or less for the past five years—and there was need for improving and increasing the distribution system to certain outlying districts. Under the provisions of the Coal Prices Order, it had been estimated that the amount to be allowed by the Company to their consumers in respect of the present quarter would be 10d. per 1000 c.ft.

A discussion followed on the reduction of dividend; and the Chairman announced that an endeavour would be made to get the Temporary Increase of Charges Act, 1918, revoked. Everything possible was being done in this direction. The motion was carried; and dividends of 3¾ p.ct. on the consolidated and new ordinary stock, and of 2 p.ct. on the new 4 p.ct. preference stock were declared, leaving a balance of £2252 to carry forward. The dividend, it was stated, would be paid as soon as possible after the assent of the Board of Trade had been received.

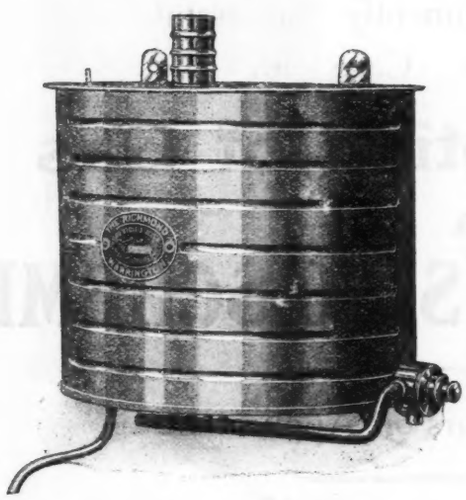
LEICESTER GAS-WORKS ACCOUNTS.

The Leicester Corporation had under consideration, at their meeting last Tuesday evening, the accounts of the Gas Committee for the year ended Dec. 31, showing that, after paying interest and sinking fund charges, and £1466 in part payment to the Public Works Loan Commissioners, there was a net profit of £4771 applicable to the district fund, or by which the Council might increase the present reserve fund of £60,749, or appropriate it for the renewal of works. The revenue account showed that the manufacture of gas cost £381,095, against £280,592 in the year 1918; coal accounting for £202,876, against £177,026, and oil and coke for water gas for £60,444, as compared with £25,789. Wages for carbonizing were £24,722, compared with £20,352; wages for generating water gas £1696, against £932; gas repairs and maintenance of works, &c., £67,837, against £38,557. Distribution expenses amounted to £83,900, compared with £58,114 in the corresponding twelvemonth. Rates and taxes were £54,328, against £42,258; and the total expenditure was £535,755, compared with £395,666 in 1918. Sales of gas realized £451,718, against £350,555 the previous year; rents of stoves yielded £4351, compared with £4249; and residual products £146,123, against £124,532. The total receipts amounted to £605,629, compared with £482,251; and £69,873 was carried to the profit and loss account, against £86,645 in 1918.

Mr. G. H. HILTON, in moving the adoption of the report, expressed regret that the year 1919 did not fulfil any of the hopes which some might have expected from the period following the war. On the contrary, it had proved to be full of anxiety and difficulty such as the gas industry had never before experienced. The difficulty in obtaining coal and all other commodities of any sort had been greater than it ever had been before; and the prospects for the future gave no ground for immediate relief. The delivery of apparatus for the most economical method of producing gas, by means of vertical retorts, had been most disappointing and it was useless to expect the plant contracted for last year to be ready by the coming winter. The year's trading yielded a better return than was expected in June last, when the Committee received the Council's sanction to increase the price of gas by 10d. per 1000 c.ft.; it being then estimated that the accounts would merely balance. Since that time the price of coal had advanced considerably more than was expected, and other additional expenditure followed, together with an advance of railway rates in December last so that the Committee were pleased to be in a position to report a small net profit of £4771, instead of what appeared likely to be a deficit. In May last the Council resolved to apply £16,500 spread over three years towards the cost of the new vertical retorts at the Aylesbone Road works; this being the calculated value of the unexpired loan in respect of No. 1 retort-house there and its equipment. The Committee, therefore, proposed to apply the sum of £4771 as the first contribution to this account. The outstanding debt on the undertaking at Dec. 31 last was £859,818, being the lowest aggregate figure for many years. The

Richmond's "Lyn" Boiler.

Hot Water Supply.



AN ideal apparatus for new houses, specially suitable for fitting over wash-up sinks or lavatory basin where a moderate supply of hot water is required for general domestic use. Patent thermostat reduces gas when water is hot and raises gas when water is drawn off. No attention is required, the boiler is always full of water, it is only necessary to turn on the water tap, every other working part is automatic. Constructed of stout copper and supplied in four sizes of from 2 to 6 gallons capacity.

Supplies of the special "Lyn" Folder No. 2247 are now available for distribution to consumers.

THE RICHMOND GAS STOVE & METER CO., Ltd.,
Academy Street, Warrington. 164-172, Queen Victoria Street, E.C. 4.

difference between the receipts and payments represented as nearly as possible the difference between this year's and last year's profit, and was £21,800, or just over 2d. per 1000 c.ft. of gas sold.

The adoption of the report was seconded by Mr. CARVER.

Mr. HILTON, in reply to a question about the quality of the gas now being supplied, pointed out that the difficulty which was being experienced in regard to Leicester gas was shared by other undertakings throughout the country. There was no real immediate prospect of improvement while such difficulties prevailed as at present obtained. The gas locally had, as a fact, been improved a little recently.

The report was adopted.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 15.

The position of pitch is still exceptionally good; and there are many inquiries in the market for this and next season's. The value exceeds 115s. net per ton for best makers. Tonnage is rather plentiful at present, and heavy shipments are taking place. Creosote is worth 11d. net per gallon in bulk, and is in considerable demand for the home trade. Other products are unchanged.

Nor is there anything new to report in the position of sulphate of ammonia for home agriculture. As regards export, it is hoped that the prohibition will cease at the end of May next.

Tar Products in the Provinces.

March 15.

The average values for gas-works products during the week were: Gas-works coal tar, 71s. 6d. to 76s. 6d. Pitch, East Coast, 115s. to 120s. per ton f.a.s.; West Coast—Manchester, 110s. to 115s.; Liverpool, 110s. to 115s.; Clyde, 115s. to 117s. 6d. nominal. Benzol 90 p.ct., North, 2s. 3d. to 2s. 4d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 2d. to 2s. 4d. Toluol, naked, North, 2s. 5d. to 2s. 6d. nominal. Coal tar crude naphtha in bulk, North, 10d. to 10½d. Solvent naphtha, naked, North, 3s. 3d. to 3s. 4d. Heavy naphtha, North, 3s. 2d. to 3s. 3d. Creosote, in bulk, North, liquid, 10½d. to 10¾d.; salty, 7d. to 7½d. Heavy oils, in bulk, North, 11½d. to 1s. Carbolic acid, 60 p.ct., 3s. 3d. to 3s. 6d. Naphthalene, £22 to £25; salts, £7 10s. to £8 10s., bags included. Anthracene, "A" quality, 7½d. to 8d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is no material change in the situation. Pitch continues irregular. In the North, some sellers are talking about 125s.; but one could probably buy at 120s. f.a.s. Freights are still difficult. Continental demand may continue for some time yet; and although the consumption of pitch for fuel making purposes should begin to fall off next month, it would perhaps be unwise to assume that prices will not advance further. Creosote continues in request, and the tendency is upward. Sellers are inclined to obtain 1s.; but no definite information is available that this figure has been paid. American buyers are offering more money; and there is some prospect of larger export business. Benzols are steady. The attempt to show that there was undue inflation in values has failed; and the Association certainly acted rightly in exposing such a fallacy. The demand is heavy; and it is almost certain that prices will have to be increased further—the superior thermal value is a point which must always be taken into consideration. Pure benzol and toluol are both in request at 3s. Solvent naphtha is a strong market, and lower prices are not looked for. Naphthalenes are steady at late rates. Carbolic acids are firm; and while crude 60's is reported to have been sold as high as 4s. in casks, free, 3s. 8d. is about the current value. Crystal is scarcer, and inclined to be dearer. Pyridine is in favour at the moment, with the result that production may be increased, although the extent of the demand is uncertain. The most remarkable feature of the trade is the strength of cresylic acid, in which sales are reported at 4s. 6d. Sellers are asking 5s. in some districts—an extraordinary figure for cresylic. Prices of all intermediates are well maintained and many lines are scarce.

Latest quotations are as follows:

Benzol: 90% London 2s. 4d. to 2s. 5d., North 2s. 3d. to 2s. 4d.; 50-90% 2s. 2d. to 2s. 3d. London, 2s. 1d. to 2s. 2d. North; crude 60-65%, 1s. 5d. to 1s. 7d.; pure, 3s. per gallon naked.

Crude Tar: London, 62s. 6d. to 67s. 6d.; Midlands, 58s. to 65s.; North, 57s. to 62s. 6d. per ton *ex* works. Refined tar, 42s. per barrel (free) on rail.

Pitch: London, 125s. per ton; East Coast, 112s. 6d. to 117s. 6d. per ton; West Coast, 115s. to 120s., with Manchester 115s. per ton, and Glasgow 120s. per ton; South Wales, 125s. per ton.

Solvent Naphtha: London, 3s. 9d. Provinces average 3s. 6d. per gallon.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 4d. per gallon.

Naphthalene: Refined, £25 per ton nominal; crude, £8 to £12 10s., according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 3s.

Creosote: London, 11½d.; North, 10½d. to 11d.; heavy oil, 9½d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 7d. to 1s. 8d. per lb., drums free.

Cresylic Acid: 95%, 4s. to 4s. 6d.; 97-99%, 4s. 3d. to 4s. 9d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 3s. 9d. per gallon; crystals 40%, 1s. 3d. to 1s. 4d. per lb.

The NAUTILUS Gas Fire Flue

(Cast Concrete, 12 in. × 3 in., built in the thickness of the walls)

is proving an eminently successful exposition of the Case for the

Initial Adoption of Gas

in

NATIONAL HOUSING SCHEMES

Prices and Particulars on Application.

The Nautilus Fire Co., Ltd.

(Proprietors, The Davis Gas Stove Co., Ltd.)

60, Oxford Street, London, W. 1

Sulphate of Ammonia.

There is very little fresh news in this market. Practically all the make is going into home consumption at £22, which is the price fixed up to the end of May. Export prices are some 75 p.ct. higher than home prices, but relatively low in contrast with competing fertilizers. The deduction is that the domestic price is well below market value. Many manufacturers here view with anxiety their own continually increasing costs of production, and would welcome any improvement of the present maximum prices. The export demand is good, and every ton that can be spared ought to be shipped. From America comes the news that although production has been increased, conditions have not yet reached the point making it an open market commodity, and supplies are scarce. Contracts made in the past are still unfilled, and the present output is, for the most part, going to the accounts. It is anticipated that it will be Midsummer before any surplus is available; and practically all dealers are now devoting their attention to the needs of the last half of the year. The market is one exception to the general export conditions; and large orders for export have recently been booked. Prices have advanced considerably; but they have not prevented or, so far as can be seen, lessened buying interest. Where supplies are available, traders seem willing to meet sellers' ideas.

Great Yarmouth Gas Company.—Addressing the shareholders at the annual meeting, Mr. T. A. Rising (the Chairman) referred to the loss of their late General Manager and Secretary (Mr. W. J. Carpenter), after 32 years' faithful service, and to the appointment as his successor of Mr. P. D. Walmsley, who is now engaged in the task of entirely reorganizing the works. The Company, the Chairman said, having no funds for this purpose, it was necessary to secure fresh capital; and a Provisional Order had been deposited with the Board of Trade. The Company might expect to secure the capital powers asked for, with slight modification. They would also have power to borrow 50 p.ct. instead of 25 p.ct. by way of mortgage on their issued capital, which placed them in a favourable position. As the result of an appeal by the Company, the Assessment Committee agreed to reduce the assessment on the works, plant, and mains by one-half for one year—the position to be reviewed periodically until such time as the Company were in a more favourable financial position. Under this arrangement they would benefit substantially during the present year—to the extent of £600—and receive a return of £420 of rates already paid. This relieved them to the extent of a little over £1000. Before they met again, the Directors hoped to have made very substantial progress with the reconstruction programme, and to be beginning to see the improved results which they had every confidence would be obtained. The Manager assured them—and the Directors had every confidence in what he said in this respect—that they would save some thousands of pounds annually, after meeting the increased capital charges, by the introduction of modern plant.

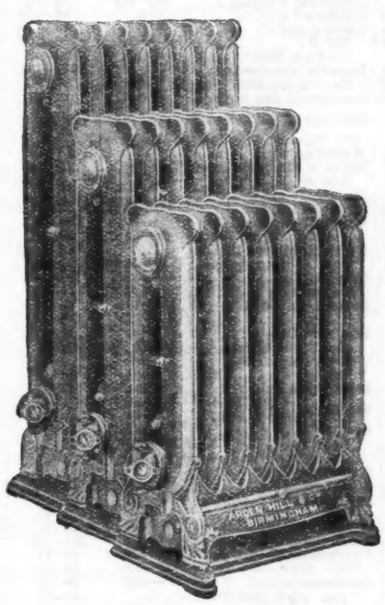
Cork Gas Company.—It was stated at the half-yearly meeting of the Company that, as compared with the corresponding six months of 1918, the accounts showed an increased consumption of gas. The balance of profit was £2590; and the dividend of 6 p.ct. per annum needed £3070, so that £480 had to be taken from reserve.

Smethwick and Gas for Power.—In a report dealing with the revised prices for gas at Smethwick, the Chairman of the Gas Committee (Alderman Pinkney) states that power gas is the mainstay of the concern. "To ensure that this class of consumer will continue to use this service of heat and power, every effort must be made to cheapen the supply." It is proposed to charge 4s. 5d. per 1000 c.ft. for gas for power. Ordinary gas consumers will receive a concession of 8d. in respect of the decrease in the price of coal; but 3d. is added for the increased cost of production, and the price after March will be 4s. 1d. per 1000 c.ft.

Blackpool Gas Accounts.—At a meeting of the Blackpool Corporation Gas Committee, Mr. W. Chew (the Gas Engineer) reported a net surplus of between £5000 and £6000. He stated that he had estimated a revenue on the year of £151,735, and an expenditure of £135,010, leaving a gross balance of £16,725, and a net surplus of £427. Thus the report created a favourable surprise. The previous year the balance was £10,000. The improved return was due to increased consumption and increased revenue from residuals. For next year, Mr. Chew estimates a revenue of £178,608, an expenditure of £161,858, and a gross balance of £16,750; but he does not expect any net balance, having regard to heavy expenditure.

The British Sulphate of Ammonia Federation.—At a meeting of the Glasgow Corporation Gas Committee, relative to the proposed agreement with the British Sulphate of Ammonia Federation, Ltd., and the appointment of representatives to attend a meeting in London, to consider the Articles of Association of the Federation and the terms of the proposed agreement, the Sub-Committee's representatives reported that they had attended: (1) The meeting of the Sulphate of Ammonia Association and the Equalization Committee, when they were informed of the alterations proposed to be made, and that the guarantee of the Corporation would be taken in lieu of the proposed deposit of £1 per ton of sulphate produced. (2) The subsequent meeting of interested parties, when the question of the formation of the Federation was discussed as well as the Articles of Association and proposed agreement, and when a resolution agreeing to proceed with the formation of the Federation was adopted, and a Provisional Committee (to which the Corporation are invited to nominate a representative), were appointed to revise the articles and agreement. The representatives further intimated that in their view no decision as to joining the Federation should meantime be arrived at, but that the whole matter should be remitted to the Sub-Committee on Bye-Products, who would again report after the revised Articles of Association and agreement had been received and considered. The Committee approved of this course.

The Perfect System of Gas-Heating for Large Buildings



The Radiators are made in three heights—26-in., 32-in., 39-in.

ARDEN HILL'S

"MARS" Gas-Heated - Steam - RADIATORS

WITH PATENT AUTOMATIC GAS-CONTROL VALVE.

Heat a room or building with less gas than would be required to properly light it.

They are self-contained, only need a gas-supply connection, and maintain an agreeable even temperature; at the same time the Gas Consumption is quite moderate.

They are safe, durable, and economical. Your early enquiries are invited.

ARDEN HILL & CO.,

"Acme" Works - Birmingham.

Woodall, Duckham, and Jones (1920), Ltd., has been registered as a Company, to carry on business as engineers. The capital is £170,000 in £1 shares, 50,000 of which are 10 p.ct. cumulative preference shares.

Death Resulting from Burns at Birmingham.—A verdict of "Accidental death" was returned on Wednesday last at an inquest at Birmingham on the body of Thomas Pound, a Corporation gas stoker, who died at the General Hospital from pneumonia following burns sustained twelve months ago. According to the evidence, the deceased sustained the burns while he was following his employment at the Saltley Gas-Works. A flame shot out from a horizontal retort, and his shirt became ignited. He was taken to hospital, and discharged after treatment which extended over three weeks. Subsequently, he was again admitted to the institution, and an operation became necessary. It was stated that deceased wore a short protecting shirt; and Mr. Mead (H.M. Inspector of Factories) said the question of shirts was being taken up with the Corporation. Mr. Minshull (for the Corporation) said this was the first accident of its kind at any of the Corporation gas-works.

One-Day's Coal Stock at Durham.—The City of Durham Gas Company announced that, notwithstanding repeated applications to the Coal Controller and Coal Supplies Committee, they were unable to obtain coal to meet their requirements, with the consequence that the supply in hand had been reduced to one day's stock.

Nottingham Gas Prices.—Dissatisfaction has recently found public expression in Nottingham regarding the prices charged for gas of indifferent quality, the contention in many quarters being that more consideration is being paid to the accumulation of profits than existing conditions warrant. A leading local paper, the "Nottingham Guardian," gave prominence on Friday to a letter from a correspondent, in which a vigorous protest was made against present alleged excessive prices; the writer observing: "At Sunderland, where the gas concern is in the hands of a public company, the price of gas is 1s. 5d. per 1000 c.ft., less discount. At Derby, 14 miles from Nottingham, the charge for gas, as supplied by a public company, is 2s. 9d.; and both these companies pay dividends to their shareholders. In Nottingham the Corporation, who have a monopoly, charge 4s. 6d. per 1000 c.ft. for gas of very poor quality.

STOCK MARKET REPORT.

THE Stock Exchange opened last week in rather better tone. It soon gave way to reaction, however, and things remained for the rest of the period dull and depressed; and business was desperately quiet. As before, it was the shadow of dearer money and the host of new issues in competition which caused the gloom.

The gilt-edged market was in evil case. Home Government issues dropped freely, and fresh low records were reached, as shown by the prices on Friday—viz., Consols 48¾-49⅝, War Loan 88-88⅝, Funding 67¾-69⅝, Victory 77¾-79¼. Bonds were not affected to so noticeable a degree. Home Rails were very quiet, and made no advance. Canadians shaped rather better; but Argentines were hit by the exchange.

The Foreign Market was dull. French loans see-sawed in step with the Exchange, and many other securities suffered from a like cause.

In the Miscellaneous Market, Textiles were about the only strong point; while some of the old favourites—Rubber, Oil, Shipping—were in the shade.

Business in the Gas Market showed a better array of transactions in the aggregate, and a large increase in the number of undertakings dealt in; but the more general tendency was towards rather easier prices. In the London Companies, Gas Light ordinary, preference, and debenture were all quoted 1 lower, and South Metropolitan debenture the same. Some of the Suburban companies were rather lower. In the Continentals, European gave way; but Imperial, after changing hands at 128½ on Thursday, rose on Friday to 141—a net gain of 5 to the quotation.

Bargains done for cash during the week were as follows: On Monday, European 8½, 9¼, Gas Light ordinary 59, 59¼, 59½, 59¾, 60, 60¼, ditto preference 58½, ditto debenture 50½, Imperial Continental 130, 131, 131½, 132½, Monte Video 76, Primitiva 27s. 6d., ditto preference 55s., South Metropolitan 59, 60, 60¾, Tottenham "B" 48¾, ditto debenture 63¾. On Tuesday, Croydon "A" 135, 136, ditto "B" and "C" 99½, 100, European 8¾, 8½, Gas Light ordinary 58½, 59½, 60¼, ditto debenture 50, Imperial Continental 130, 131¾, Oriental 104½, Primitiva 26s. 3d., 27s. 6d., South Metropolitan 60½, Tottenham "B" 47½, ditto debenture 64, Croydon 4 p.ct. debenture 55, Horley 4 p.ct. debenture 55, Colombo 7 p.ct. preference 8⅝, Chicago People's 5 p.ct. 83½. On Wednesday, Brentford "B" 40, European 9, Gas Light ordinary 58, 58½, 58¾, 59¼, ditto preference 58½, 59, 59½, ditto debenture 50, Imperial Continental 130, 132, ditto debenture 80, Primitiva 25s., 27s. 3d., ditto preference 55s., 56s. 3d., South Metropolitan 58¾, 59, 59½, ditto debenture 49, South Suburban 66, Malta and Mediterranean 7 p.ct. preference 41s. 3d. On Thursday, Brentford "B" 42, Gas Light ordinary 58, ditto debenture 49¼, 50⅛, ditto 10 p.ct. bonds 147, Imperial Continental 128½, 129, 130, 130½, 131, 131½, Oriental 104, 104½, Primitiva preference 53s. 9d., 56s. 3d., South African 11½, South Metropolitan 59½, 60. On Friday, Bristol 76¾, British 26, Gas Light ordinary 58, 58½, 59½, ditto preference 58¼, 58⅝, Imperial Continental 135, 136, 137, 137½, 138, 138½, 140, 141, Oriental 104½, Primitiva 25s. 6d., South Metropolitan 60½.

In the Money Market, supplies were ample, and rates ruled easy all the week. Silver had a sharp drop below 70d. on Thursday, but closed a shade better. The Bank rate is 6 p.ct., as fixed on Nov. 6, 1919.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Shares	When Ex-Dividend.	Ante-War Dividend & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	..	58—63*	..
1,561,868	"	Sept. 26	5½	2½%	Alliance & Dublin Ord.	59—64	43—48	..
874,900	"	Jan. 15	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
280,000	"	Oct. 30	7½	5%	Bombay, Ltd.	5½—6½	5—5½	..
50,000	10	Feb. 26	15	10%	Bournemouth Gas and Water { 10 p.c.	20—30	8½—9½	..
958,110	10	"	7	7%	B ¶ p.c.	15—15½	9—10	..
115,000	10	"	6	6%	Pref. 5 p.c.	13½—14	9—9½	..
162,065	—	Dec. 30	—	4%	4 p.c. Deb.	..	84—86	..
992,045	Stk.	Feb. 12	14	30/-	Brentford A Consolid.	261—266	45—50	..
784,220	"	"	11	26/8	Do. B New	204—209	40—45	40—42
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	74—76	..
221,400	"	Dec. 11	4	4%	Do. 4 p.c. Deb.	91—93	84—86	..
214,775	"	Mar. 11	11	7½%	Brighton & Hove Orig.	303—313	121—126*	..
944,208	"	"	8	5⅓%	Do. A Ord. Stk.	154—159	82—87*	..
1,287,500	Stk.	Feb. 26	6	5%	Bristol 5 p.c. max.	..	..	76½
650,000	10	Sept. 26	15½	10%	British	44—45	25—27	26
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	61—63	..
145,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	86—87	47—50	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	6¾—7½	..
180,000	10	Oct. 30	—	4½%	Do. 4½ p.c. Pref.	4—6	6¾—7	..
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,518,280	"	Feb. 26	5/3/4	33/4	Commercial 4 p.c. Stk.	106—108	54—59	..
850,000	"	"	6¾	26/8	Do. 5½ p.c. do.	108—105	50—55	..
475,000	"	Dec. 11	3	3%	Do. 5 p.c. Deb. Stk.	69½—71½	49—51	..
500,000	"	"	4	—	Continental Union Ltd.	76—79	27—32	..
900,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	40—60	..
61,600	Stk.	Feb. 26	14½	10½%	Croydon A 10 p.c.	..	130—140	135—136
276,400	"	"	11½	7½%	Croydon B and C ¶ p.c.	..	90—100	99½—100
425,270	Stk.	"	6	6%	Derby Con. Stk.	128—135	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	103—104	..	..
1,009,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	8½—9½	8¾—9½
16,298,975	Stk.	Feb. 12	4/17/4	30/-	Gas Light and Coke { 4 p.c. Ord.	98—102	57—60	58—60½
2,600,000	"	"	8¾	26/8	8½ p.c. max.	76—79	40—45	..
4,062,235	"	"	4	4%	4 p.c. Con. Pref.	96—99	57—60	58½—59½
4,874,850	"	Dec. 11	8	8%	5 p.c. Con. Deb.	72½—74½	49—51	49½—50½
130,000	"	"	10	10%	10 p.c. Bonds	..	..	147
23,500	"	Mar. 11	5	33⅓%†	Hastings & St. L. 5 p.c.	..	55—60*	..
258,740	"	"	8½	23⅓%†	Do. 8½ p.c.	37—39	33—43*	..
70,800	10	April 29	11	7%	Hongkong & China, Ltd.	16½—16¾	8½—9½	..
56,600	Stk.	Mar. 11	9	6⅓%†	Hornsey ¶ p.c.	..	88—93*	..
131,800	"	"	7½	5⅓%	Ilford A and C.	151—154	86—91*	..
85,780	"	"	6¾	4½%	Do. B	115—118	65—70*	..
85,500	"	Dec 30	4	4%	Do. 4 p.c. Deb.	92—94	59—63	..
4,949,080	"	May 14	9	4½%	Imperial Continental	150—160	137—142	128½—141
1,235,000	"	Feb. 12	8½	8½%	Do. 8½ p.c. Deb. Red.	84—86	80—85	80
235,242	"	Sept. 11	6¾	5⅓%†	Lea Bridge Ord. 6 p.c.	119—121	86—91	..
2,498,986	"	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	211—213 / 146—148	..	..
306,068	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	"	Feb. 26	7/5/6	32½%	Maidstone 5 p.c.	..	54—59	..
75,000	5	June 11	5	5%	Malta & Mediterranean	4½—4¾	1⅞—2½	..
260,000	100	Oct. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—97	..
541,920	Stk.	Nov. 27	4	5%	Monte Video, Ltd.	11½—13	72—77	76
1,575,892	"	Feb. 26	4½	3⅛%	Newcastle&Gatsh'd Con.	98½—99½	63½—64½	..
532,726	"	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	92—93	56—57	..
15,000	10	Mar. 11	—	8⅓%†	North Middlesex 10 p.c.	..	13—13½*	..
55,940	10	"	7/14/0	6⅓%†	" " 7 p.c.	14—16	8½—9½*	..
800,000	Stk.	Nov. 27	8	8%	Oriental, Ltd.	117—122	102—105	104—104½
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	4½—5½	..
68,000	50	Mar. 11	13	7½%	Portsea, Island B	128—131	66—71*	..
100,000	50	"	12	6⅔%	Do. C	118—121	58—68*	..
249,980	5	April 29	5	—	Primitiva Ord.	5½—6	1½—1⅔	25/—27/6
499,950	5	June 26	5	—	Do. 5 p.c. Pref.	4¾—5	2½—3	53/9—56/3
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	70—72	..
600,000	Stk.	Jan. 29	4	4%	Do. " " 1911	..	48—51	..
545,198	"	Dec. 30	4	4%	River Plate 4 p.c. Deb.	86—87	47—50	..
150,000	10	Sept. 26	5	5%	San Paulo { 6 p.c. Pref.	10½—11	7½—8	..
195,000	50	Dec. 30	5	5%	{ 5 p.c. Deb.	47—49	39—41	..
185,000	Stk.	Mar. 11	10	5%	Sheffield A	238—234	68—73*	..
999,984	"	"	10	5%	Do. B	233—234	68—73*	..
533,500	"	"	10	35/5	Do. C	230—233	68—73*	..
188,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	Oct. 15	9	10%	South African	10½—11½	12—15	11½
6,609,895	Stk.	Feb. 12	5/4/0	30/-	South Met. 4 p.c. Ord.	111—113	58—61	58⅝—60½
250,000	"	Jan. 15	—	5%	Do. Pref.	..	93—95	..
1,895,445	"	"	8	8%	Do. 8 p.c. Deb.	72½—74½	49—51	49
234,890	"	Feb. 25	3½	3⅛%	South Shields Con. Stk.	157—160	104—106	..
1,087,795	"	Aug. 14	6	3⅔%	S'th Suburb'n Ord. 5 p.c.	114—116	66—71	66
217,558	Stk.	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	78—83	..
547,140	"	Nov. 13	7½	3⅔%	Southampton Ord.	99—102	61—63	..
121,275	"	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	61—63	..
120,000	"	Aug. 14	—	33⅓%	Tottenham { A 5 p.c.	135—138	68—73	..
769,275	"	"	6	2⅔%	{ B 3½ p.c.	115—117	48—53	47½—48½
181,255	"	Dec. 11	4	4%	District { 4 p.c. Deb.	87—89	63—65	63½—64
183,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
236,475	Stk.	Sept. 26	5	3⅓%	Tynemouth 5 p.c. max.	103½—109	74—76	..
80,000	"	Feb. 26	8⅔	55/-	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—155	83—88	..
265,536	"	"	6½	40/-	Do. B 3½ p.c.	129—134	61—66	..
108,078	"	"	—	38/6	Do. C	..	61—66	..
140,868	"	"	—	38/6	New Ordinary	..	61—66	..
259,000	"	"	5⅓	33/9	Wimbledon 6 p.c.	117—122	63—68	..
98,000	"	"	6⅔	40/-	Epsom 5 p.c.	121—126	63—68	..
58,416		Dec. 30	8	8%	8 p.c. Deb. Stk.	88—89	48—50	..

* Ex Div. † Next dividend will be at this rate.

Arthur Duckham and Co. (1920), Ltd.—A Company with this title has just been registered; the capital being £50,000 in £1 shares.

Increased Consumption at Bishop's Stortford.—An increase in consumption during the past six months, of 30·85 p.ct., as compared with the same period of 1918, was recorded at last week's meeting of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company. The balance of the profit and loss account was sufficient to pay dividends at the maximum rates authorized by the Company's Temporary Increase of Charges Order, and to leave a balance of £508 to be carried forward.

Gas Consumer's Profiteering Charge.—The Bradford Profiteering Committee have been investigating a charge by a gas consumer against the Corporation. The complainant, in a written statement, said he had cut down his consumption by 50 p.ct. in response to the Corporation's appeal for economy; but he found that his bill was doubled. Smothering his chagrin, he decided to burn no more gas, and cut off the supply at the meter. When a gas inspector called later, the consumer learned that he would have to pay for a minimum of 1000 c.ft., even though he had used none and none had been registered by the meter. It should be stated that this charge for a minimum so long as the service is maintained is an accepted custom; and though the Tribunal will report at the next meeting, it is hardly conceivable that there will be any outcome of the case.

Having reconsidered a resolution as to a proposed increase in the rates of stove-hire, the Gas Committee of the Macclesfield Town Council have decided not to make any alteration in the present charges.

To the "over-heating of a gas-stove" is attributed a fire which did a small amount of damage to the offices of the Sheffield Silver Plate and Cutlery Company. Chemicals and a hand-pump extinguished the flames.

The Directors of the British Gas Light Company will, at the half-yearly general meeting to be held on the 31st inst., propose a dividend at the rate of 10 p.ct. per annum for the half year ended Dec. 31 last (less income-tax), payable in April.

Messrs. William Sugg & Co., Ltd., of Vincent Works, Westminster, have issued a new catalogue which furnishes particulars of their many well-known makes of gas cookers, hot-plates, boilers, &c. There is apparatus illustrated suitable for the smallest house and the largest restaurant.

The Bradford Corporation Gas Committee have expressed the opinion that the time is not opportune for the discussion of the question of the sale to the Spenborough Urban District Council of that part of the Bradford gas undertaking which is within the late Cleckheaton urban district.

Damage to the extent of about £100 was done by a small explosion of creosote oil at the laboratory of the New Wortley Gas-Works of the Leeds Corporation on Wednesday last. An experiment was being carried out at the time. A small fire broke out; but this was extinguished by the patent appliances.

The number of inquiries reaching them from works foremen and operatives having led the British Aluminium Company, Ltd., of No. 109, Queen Victoria Street, E.C., to believe that booklets giving practical hints in a concise and handy form on working the metal might supply the need, they have had a series prepared. Nos. 2, 3, and 4, which are before us, deal respectively with working on aluminium sheets, circles, and tubes.

In the Marsden Urban District Council last week, Mr. Robinson moved that an expert be appointed to inquire into the management of the gas-works. The motion was seconded; but an amendment was carried to the effect that the matter be referred to a Sub-Committee of the Council, who, if they thought advisable, could recommend the appointment of an expert. A further amendment by Mr. Robinson that the matter be referred to the Gas Committee was eventually agreed to.

The staff and employees of the Tipton Gas-Works met together on Saturday to present their Cashier, Mr. Frank Hollyhoke, with a handsome canteen of cutlery, on the occasion of his marriage. The Secretary (Mr. J. H. Stockdale), in making the presentation, spoke of the good feeling existing between the staff and Mr. Hollyhoke. Though Mr. Hollyhoke had only been with them about six months, the staff felt they could not let the event go by without marking their good wishes for his future.

At a recent meeting, on the proposition of a Socialist member, the Bradford City Council added to a Gas Committee decision to allow a rebate of 2s. 6d. per ton on coke sold to merchants and dealers for retail sale, the words "and to consumers making their own arrangements as to carting." Since then, the Gas Committee have resolved that, being of opinion that the City Council adopted the amendment under a misapprehension as to its effect, the Council be recommended to rescind their decision, and to adopt the original resolution of the Gas Committee.

In their report for the year ended Jan. 31, the Directors of Messrs. C. & W. Walker, Ltd., state that the profit, after charging directors' fees and depreciation on buildings and plant, amounts to the sum of £15,475. After adding the balance brought forward, there is a sum of £26,848 standing to the credit of profit and loss account. Dividends for the first half of the year have already been paid at the rates per annum of 5½ p.ct. on the preference shares and 10 p.ct. on the ordinary shares; and the Directors recommend the payment for the last six months at the same rates, with a bonus of 1s. per share on the ordinary shares—free of income-tax, as is the dividend on these shares.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
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THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement Feb. 17, p. 399.

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A BRITISH Oxide Cheaper and Better than Bog Ore. 35 per cent. Water, 75 per cent. Ferric Hydrate.

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(See p. 660.)

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.

We Guarantee promptness with efficiency for Repairs.

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Head Office: 109, Exchange Buildings, Birmingham.

Full Particulars and Membership Forms may be obtained from the GENERAL SECRETARY.

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MECHANICAL Engineer, who is used to Manufacture of Coal Washers, Stills, and various other Plant and Apparatus, is OPEN TO TAKE RESPONSIBLE POST on Coke-Oven or Gas-Works.

Address, stating Duties and Salary, to No. 6867, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

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WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualifications being equal, has the FIRST CALL ON YOUR CONSIDERATION.

MELTON MOWBRAY GAS COMPANY.

APPLICANTS for Appointment of ENGINEER and MANAGER are THANKED, and Informed the POST HAS BEEN FILLED.

WANTAGE URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS MANAGER.

THE above Council invite Applications for the Appointment of MANAGER of their Gas-Works.

Applicants must have had previous Experience in his duties, which comprise in addition to those of Manager, the keeping of all Books in connection with the Gas-Works and the Collection of the Accounts which at present amount to about £4500 per Annum. Clerical assistant provided.

The Gas made is about 14 million cubic feet a year.

House, Coal, and Gas are provided the Manager by the Council.

Applications, in candidate's own Handwriting, stating Age, previous Experience, and Salary required, and accompanied by *Copies* of Three Testimonials of recent date, must reach me not later than the 25th day of March, 1920.

By Order of the Council,
EDWD. B. ORMOND,
Clerk.

Council Offices, Wantage,
March 10, 1920.

HALESWORTH GAS COMPANY.

THE Directors of the Halesworth Gas Company invite Applications for the Appointment of WORKS MANAGER. The Works are now being Reconstructed. Present make, about 4 millions. Good opportunity offered to an Able and Progressive Gas Manager.

Apply, stating Age, previous Experience, and Salary required, to THE HALESWORTH GAS COMPANY, 54, Conduit Street, LONDON, W. 1.

WANTED.—An Experienced Work- ING MANAGER to take Full Charge of the Gas-Works at Tetbury, Glos. (Annual make, 7 Millions.) Must be Competent, Steady, and have a Thorough Knowledge of the Manufacture of Coal Gas, Setting of Retorts, Laying of Mains and Services, Fitting Cooking Stoves, Reading Meters, &c. House, Coal, and Gas Free.

Apply, by letter, stating Age, Experience, and Salary required, and enclosing *Copies* of Testimonials, to the GAS COMPANY, TETBURY, GLOS.

WANTED—Assistant Manager for small Tar Distillery.

Apply, by letter, stating Age, Experience, and Salary, to No. 6868, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

THE Fuel Economy Committee of the Federation of British Industries desire the services of a TECHNICAL EXPERT capable of Investigating and Advising upon the Economical Production and Application of Producer Gas in Industrial Works.

Please state full Details, with Dates, of Education, Training, and subsequent Experience, together with Salary required.

Applications, which will be treated in Confidence, should be forwarded to the SECRETARY, 39, St. James's Street, LONDON, S.W. 1.

WEST'S Gas Improvement Company, Limited, Albion Iron-Works, Miles Platting, Manchester, require several SKILLED DRAUGHTSMEN for Structural and General Mechanical Engineering Work.

Apply, stating Age, Experience, Salary required, and when at liberty.

WANTED — Two Experienced DRAUGHTSMEN accustomed to Gas-Works Plant and Constructional Steel Work; also two Experienced DRAUGHTSMEN accustomed to Blast Furnace and Steel Works Plant. None but Fully-Qualified Men need apply.

Please state Age, Experience, Salary required, and how soon at Liberty, to NEWTON, CHAMBERS & CO., LTD., Thorncliffe Ironworks, near SHEFFIELD.

WANTED—Junior Technical Assis- TANT capable of carrying out the usual Gas-Works Tests and Working Drawings. Preference given to Applicant having Experience of Vertical Retorts.

State Age, Experience, and Salary required, immediately to the ENGINEER AND MANAGER, GAS-WORKS, BATLEY.

WANTED—Well-Qualified Carboniz- ING FOREMAN for works of about 600,000,000 c.ft. Must be able to Take Entire Charge of Machine-Stoked Retort-House, including Regulation of Heats and Control of Men.

Applications, with *copies* of three recent testimonials, and stating Age, Experience, and Wages required, to No. 6866, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WANTED—An Energetic and Reli- able CARBONIZING FOREMAN for Shift Work, with Experience of Regenerator Settings, Electrical Stoking Machinery, Sulphate Plant, and General Gas-Works Routine.

Apply, giving Age, Experience, and Wages required, to the ENGINEER AND MANAGER, Gas-Works, NEW BARNET, Herts.

CHIEF Slot Collector Required capable of Supervising Work of Slot Meter Collectors (approximately 7000 consumers).

Applications, stating Age, Experience, Wages required, and how soon at Liberty, to be addressed to the SECRETARY, Town of Dudley Gas Light Company, DUDLEY, Worcestershire.

WANTED — Meter Repairer. Per- manency for a Reliable Man.

Apply, stating Age, Experience, and Wages required, to the MANAGER, Gas-Works, SHIREBROOK, near Mansfield.

PLANT, &c., FOR SALE & WANTED

FOR SALE.—De Brouwer Pusher and CHARGER MACHINES. Suitable for Beds of Ten 20 ft. retorts. Five Ton Hopper on Charger. Both Machines have been Completely Overhauled and are in Excellent Condition.

Apply No. 6864, care of Mr. KING, 11, Bolt Court FLEET STREET, E.C. 4.

FOR SALE. — High-Class Steam- BOILERS.

Lancashire,	30 ft. by 8 ft.	diameter, for	180 lbs.	W.P.
,,	30 ft. by 8 ft.	,,	160 lbs.	,,
,,	30 ft. by 8 ft. 6 in.	,,	120 lbs.	,,
,,	30 ft. by 8 ft. 6 in.	,,	100 lbs.	,,
,,	30 ft. by 9 ft.	,,	100 lbs.	,,
,,	30 ft. by 8 ft.	,,	100 lbs.	,,
,,	30 ft. by 7 ft. 6 in.	,,	150 lbs.	,,
,,	30 ft. by 7 ft. 6 in.	,,	120 lbs.	,,
,,	30 ft. by 7 ft. 6 in.	,,	100 lbs.	,,
,,	28 ft. by 8 ft.	,,	160 lbs.	,,
,,	28 ft. by 8 ft.	,,	100 lbs.	,,
,,	28 ft. by 8 ft. 6 in.	,,	100 lbs.	,,
,,	28 ft. by 7 ft. 6 in.	,,	160 lbs.	,,
,,	28 ft. by 7 ft. 6 in.	,,	120 lbs.	,,
,,	28 ft. by 7 ft.	,,	120 lbs.	,,
,,	27 ft. by 7 ft.	,,	100 lbs.	,,
,,	28 ft. by 7 ft.	,,	160 lbs.	,,
,,	21 ft. by 7 ft.	,,	150 lbs.	,,
Cornish	28 ft. by 6 ft. 6 in.	,,	160 lbs.	,,
,,	20 ft. by 6 ft. 6 in.	,,	120 lbs.	,,
,,	12 ft. by 5 ft.	,,	100 lbs.	,,

Many others, all Sizes and Pressures, at Reasonable Prices for IMMEDIATE DELIVERY; and Guaranteed to Reinsure for Pressures named. Send your Inquiries to Specialists:—

RATCLIFFE & SONS, "The Boiler-House," HAWARDEN. 'Phone 86.

FOR SALE—Calorimeter (Boys) complete with Wet Meter, Balances, Governor, and Thermometers, &c. Nearly new.

SMITH, IMBER COURT, THAMES DITTON.

STOCKPORT CORPORATION.
(GAS DEPARTMENT.)

SPARE ENGINES, &c.

FOR SALE—

One 50,000 c ft. per hour Bryan-Donkin's ROTARY EXHAUSTER, Direct Coupled to Horizontal STEAM-ENGINE on combined BED PLATE. Engine Cylinder 6 in. diameter, Stroke 6 in., Crankshaft 2 in. diameter, Flywheel 30 in. diameter, 4 in. wide, Steam Pressure 100 lbs., Speed 100 R.P.M., B.H.P. 3·3, including 2 10 in. diameter Disc Valves.

One 40,000 c.ft. per hour EXHAUSTER, with ENGINE, &c., exactly as above, including 2 8 in. diameter Disc Valves.

One Spare STEAM-ENGINE, Bryan-Donkin's make, Cylinder 7 in. diameter, Stroke 8 in., Crankshaft 2½ in. diameter, Flywheel 36 in. diameter, 5 in. wide, Steam Pressure 100 lbs., Speed 100 R.P.M., B.H.P. 5·9.

One Bryan-Donkin's Horizontal STEAM-ENGINE, complete with Fittings, Cylinder 8½ in. diameter, Stroke 14 in., Crankshaft 3 in. diameter, Flywheel 4 ft. 6 in. diameter by 6 in., Steam Pressure 80 lbs., Speed 80 R.P.M., B.H.P. 11·5.

One Marshall's Horizontal STEAM-ENGINE, Cylinder 9 in. diameter, Stroke 12 in., Flywheel 4 ft. 4½ in. diameter, 11 in. wide, Steam Pressure 80 lbs., Speed 175 R.P.M., H.P. 17½ to 24 (not quite complete).

For further Particulars, apply to—
S. MEUNIER,
Engineer and Manager.
Gas-Works,
Stockport.

MACHINE TOOLS FOR IMMEDIATE DELIVERY.

CAPSTAN and Turret Lathes—
One, as new, 1 in. Dreses, Capstan LATHE.
One Second-Hand 1¼ in. Foster TURRET LATHE, with Pump.
Two New 1½ in. Cincinnati Acme CAPSTAN LATHES, with Pump.
One Second-Hand 1 in. Pratt & Whitney CAPSTAN LATHE.
Five new Wells Wire Feed CAPSTAN LATHES, ½ in. Collet, ⅝ in. Hollow Spindle.
One, as new, 3½ in. Bar Feed Foster COMBINATION CAPSTAN LATHE, with 16 in. Four Jaw Chuck, with 3 in. Collet.
Six Second-Hand, good condition, Herbert No. 9 TURRET LATHES. Single Pulley Drive, All-Geared Head (without Cross-Slides).

Centre Lathes—
Two, as new, 8 in. by 6 ft. straight Bed S.S.S. and Sc. LATHES, by Lang.
Three new 9¾ in. by 8 ft. straight Bed S.S.S. and Sc. Wilson LATHES, with Chuck Steel Turret, Pump.
Five, as new, 9½ in. by 10 ft. straight bed S.S.S. and Sc. New Haven LATHES, 5 ft. 6 in. between Centres.
Five, as new, 8½ in. by 8 ft. Gap Bed S.S.S. and Sc. LATHES, by Summerscales, with Pump.
Two, as new, 9½ in. by 8 ft. straight Bed, Sliding and Surfacing LATHES, by Denham.
Four Second-Hand, good condition, 8½ in. by 8 ft. straight Bed S.S.S. and Sc. LATHES, by Dean Smith & Grace, with pump.

Boring Lathes—
One, as new, 26 in. swing Boring and Surfacing LATHE, by Darling & Sellers, with Hexagon Turret, 8 ft. Bed.
One new 32 in. swing Richards type Boring LATHE.

Grinders—
One new Brown & Sharpe No. 14 Plain GRINDER, capacity 12 in. by 30 in. complete.
One new 8½ in. Magnetic Chuck Ring GRINDER, with Pump.
Two New Universal Tool and Cutter GRINDERS.
Three new TOOL SHARPENING and HONING MACHINES.
Two, as new, 20 in. by 2 in. Wet TOOL GRINDERS.
One new Dumore Portable ELECTRIC GRINDER.

Millers—
One, as new, Profile MILLING MACHINE, table 16 in. by 30 in.
One Second-Hand No. 2 Becker Vertical MILLERS.
One new Baker No. 1 KEYSEATER complete.
Full Particulars on application to—
THE JUDSON-JACKSON COMPANY, LTD., 50, MARSHAM STREET, WESTMINSTER, LONDON, S.W. 1.

REDHILL GAS COMPANY.

THE Directors have for Immediate DISPOSAL a Set of Four Water Lute PURIFIERS, each 12 ft. by 12 ft. by 5 ft. Deep, complete with Grids, Lifting Gear, 12 in. Connections and Milbourne's Patent Outside Purifier Valves. The Plant is in Excellent Condition, having been in use only a few years for C.W.G. Purification.

Inspection can be made at any time, and further information obtained from
W. H. BENNETT,
Managing Director.
Gas Offices,
Redhill, Surrey.

THE Workington Corporation Gas Department have for DISPOSAL a ROTARY SCRUBBER-WASHER complete with ENGINE and 12-in. Inlet and Outlet VALVES.

The Washer can be Inspected and further Particulars obtained on Application to the ENGINEER, GAS-WORKS, WORKINGTON.
Feb. 23, 1920.

FOR SALE—Rotary Washer-Scrubber with STEAM-ENGINE and 12 in. Inlet and Outlet Pipes and Valves. Recently used for Benzol Extraction. May be Inspected by Appointment.

Apply to the ENGINEER, Gas-Works, WESTON-SUPER-MARE.

1919—No. 578.

In the High Court of Justice in Ireland, Chancery Division, Mr. Justice Powell. Companies Winding Up. In the matter of the Companies' Consolidation Act, 1908, and in the matter of the Ennis Gas Consumers' Company, Limited.

TO BE SOLD AS A GOING CONCERN, subject to approval of the Court, the Undertaking known as the ENNIS GAS CONSUMERS' COMPANY, LIMITED, including PREMISES, PLANT, MACHINERY, GOODWILL, CHATTELS, and EFFECTS, on Thursday, the 25th day of March, 1920,
at ONE O'CLOCK, by

MICHAEL McMAHON, the Auctioneer approved by the Court, at The Court House, Ennis. The Purchaser will not be required to pay Auctioneer's Commission.

Dated this 27th day of February, 1920.
THOS. W. ELLEKER, Chief Clerk.

For further Particulars and Conditions of Sale apply to: MICHAEL MCMAHON, Auctioneer, Abbey Street, ENNIS. ROBERT LANE JOYNT, J.P., Official Liquidator, Carnelly, CLARECASTLE, co. Clare. MOLONEY AND PILKINGTON, Solicitors, ENNIS, co. Clare. A. LANE JOYNT, Solicitor for Official Liquidator, having Carriage of Sale, 4, Stephens Green, DUBLIN.

THE Llandudno Urban District Coun- cil invite OFFERS of Second-Hand BOILERS suitable for a Gas-Works—Lancashire or Vertical. Immediate Delivery required.

Send full Particulars and Prices to CLERK TO COUNCIL, Town Hall, LLANDUDNO.

AN Offer required for a small round Cast-Iron STATION METER, about 100 Lights, with two 4 in. Flanged Bends for Inlet and Outlet. In good condition.

Apply W. CASTLE, Gas Office, FARNSFIELD, Notts.

WANTED, in the London District, a Good Second Hand COMBINED ENGINE and EXHAUSTER, with a capacity of 50,000 to 60,000 c.ft. per hour.

Particulars and Price to No. 6865, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

GAS LAMP COLUMNS.

THE Corporation of Chelmsford re- quire immediately 150 new or second-hand CAST IRON GAS LAMP COLUMNS.

State Price and full Particulars to the GAS ENGINEER, GAS-WORKS, Chelmsford.

CONTRACTS OPEN.

CORPORATION OF CALCUTTA.

REVISED NOTICE TO CONTRACTORS.

TENDERS are Invited, in Duplicate, for the Supply of 2882 ONE-LIGHT 15-INCH SQUARE COPPER STREET LANTERNS, constructed from strong Copper Sheets throughout (Unpainted), which must be made specially Insect and Dust Proof, Porcelain Reflectors complete, with Scroll Irons, without Ladder Bars and Three Set Screws. These lanterns must be of suitable size for single Inverted Incandescent Gas Burner consuming about 3½ to 4 cubic feet per hour. Separate prices to be quoted for ¾th inch Brass Adaptation Fittings (seamless tube) with Unions complete; also 21 oz. best quality English Glass Panes for the above Lamps.

Samples of the Copper Lanterns (unpainted) should be forwarded (carriage paid) for Inspection to the Superintendent of Stores, Calcutta Corporation, 149, Lower Circular Road, Calcutta. Tenders must include Cases and Packing, also Delivery Free of all Charges at the Corporation Stores. All Articles to be Insured against Breakages and Marine Risks. Delivery must be completed in September, 1920. Payment will be made for each Consignment when Delivery is accepted in terms of the Contract which a successful Tenderer is required to execute within two months from the acceptance of his Tender.

The Corporation do not bind themselves to accept the lowest or any Tender, and will be at liberty to accept the whole or part of a Tender. No Tender will be considered unless accompanied by a remittance to the extent of 2½ p.ct. on the total value of such Tender. All rates should be quoted both in words and figures; and the Tender should remain open for acceptance for Two Months from the date of opening the same.

Tenderers must abide by the rules in regard to Tenders which are in vogue in the Corporation.

Each Tender, in Duplicate, must be enclosed in a Sealed Cover and Superscribed "Tender for Copper Street Lanterns." Tenders will be received by the Deputy Chairman up to 2 p.m. on Tuesday, the 6th of April, 1920, when they will be opened in the presence of such Tenderers as may be present. Tenderers may submit their offers on their own Forms.

J. C. MUKERJEA.
Secretary to the Corporation.
Central Municipal Office,
Calcutta,
Feb. 17, 1920.

COMPANY NOTICE.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Chief Office, No. 11, George Yard, Lombard Street, in the City of London, on Wednesday, the 31st day of March, at Twelve o'clock Noon precisely, to receive the Report of the Directors and the Statement of Accounts for the Half Year ended Dec. 31, 1919; to declare a Dividend; and to deal with any Business that may be legally transacted at an Ordinary General Meeting.

NOTICE IS HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED from the 16th inst. to the 31st inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.
Chief Office: No. 11, George Yard, Lombard Street, London, E.C. 3,
March 15, 1920.

NOW READY.

Price 10s. 6d. Post Free in the United Kingdom.

THIRTY-SEVENTH YEAR.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1919.

WALTER KING, "JOURNAL" OFFICE, 11, BOLT COURT, FLEET ST., LONDON, E.C.4.

SAVE MONEY

BY DRIVING YOUR AUXILIARY PLANT ELECTRICALLY

I have special experience in this work, and my services are at your disposal.

W. T. WARDALE, A.M.Inst.E.E. 13, The Drive, Marlcliffe Road, SHEFFIELD.

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Specialists in Gas Coal and Cannel.
COKE MERCHANTS.
Telegrams: "Darwinian, Manchester." Telephone: 8268 and 8269 City.

KENYON'S PATENT OIL FILTER and WATER SEPARATOR
Over 900 ordered by H. M. Government.
ENGINEERS' STORES, TOOLS.
ALEXANDER KENYON & CO., LTD.,
Victoria Bridge, MANCHESTER.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
London Office:
NORFOLK HOUSE, 7, LAURENCE POUNTNEY HILL, E.C.4.

JOHN J.
GRIFFIN
& SONS, LTD.,
KEMBLE ST.,
KINGSWAY, LONDON, W.C.
MAKERS OF ALL THE
"BOYS" GAS CALORIMETERS
which have been in daily use in all the Official Testing Stations in London since the calorimetric test was introduced in 1906.
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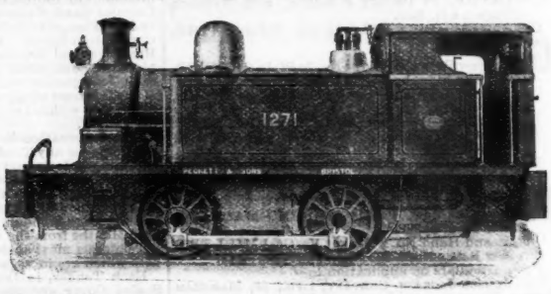

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